Teacher Bulletin Volume 6

Plants

A Theme Unit to Support the
Science
Management
And
Resource
Tool

Spirit-compatible instruction
Cooperative learning
Multiple intelligences
Cross-curricular
Hands-on

Multi-grade lesson plans (K-8) and practical resources for the one-room or small-school teacher.

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Spirit-compatible Instruction

Spirit-compatible instruction is a modification of an approach called Integrated Thematic Instruction (ITI) which is said to be brain-compatible instruction. Spirit-compatible instruction takes ITI to another level by incorporating and emphasizing the spiritual while addressing the role of the whole person, including body and mind.

In the classroom, this approach begins by ensuring that the environment is physically and emotionally safe and supportive of the needs of the brain. We begin by addressing the following environmental issues:

- pure air (no odors caused by mildew or chemicals)
- pure water
- adequate lighting
- calming colors and decorations
- clutter free and organized
- provision for movement

Next we work to provide students with an emotional environment characterized by the following:

- an assurance of unconditional love
- personal significance
- absence of threat and strategies for conflict resolution
- clear, consistent and fair boundaries
- adequate time to complete requirements
- meaningful content
- interesting and relevant resources
- peaceful collaboration with peers
- instruction targeted to challenge without overwhelming
- reflective thinking
- choice

Throughout instruction we emphasize and integrate spiritual values. This is done by:

- assuring students of the unconditional love of God
- beginning the day with worship
- teaching students the relevance of prayer throughout the day
- systematically teaching positive character traits which embody the fruits of the Spirit
- providing discipline in a spiritual context
- the teacher acknowledging her/his dependence on God

Since spirit-compatible instruction is adapted from ITI, attempts have been made to consistently give credit. This is indicated on materials such as "light-skills" (called lifeskills by ITI) banners and bulletin boards. The credit should read: "Adapted from Susan Kovalik and Associates". ITI cannot be taught as such by anyone other than a person trained by Susan Kovalik and Associates. Therefore, caution has been taken to make SCI our own to the greatest extent possible.

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Introduction

The accompanying theme unit was written with the "one-room school" in mind, though it could easily be used in any multi-grade setting. It is meant to support the Science Management and Resource Tool (SMART), which enables teachers to provide instruction on a particular science topic across grades 1-8. Topics are organized in a four year cycle which provides for larger blocks of instructional time (a quarter per topic), allowing time to fully develop the subject. The objectives have been taken from the curriculum guide developed by the NAD. Lower grade (1-4) objectives have been meshed with upper grade (5-8) objectives when possible to do so without compromising the expectations of the older students. Some activities have been predicated on the belief that older students will often participate in activities for the benefit of younger children which they would otherwise think age-inappropriate. An advantage of this is that older students whose skills or knowledge is insufficient have an opportunity to review or learn for the first time what they may have missed in the past without the stigma of being "held back". Additionally, younger students whose knowledge or interest is advanced have opportunities to be exposed to more sophisticated material.

Cooperative learning structures have been integrated throughout the unit and explanations of these are provided in the Appendix A. The 8th grade science text "Exploring God's World" is used as a resource for the upper grade students. Cross-curricular resources and activities, including theme related worship ideas, are provided and may be used as the teacher sees fit.

This particular unit relies heavily on projects and experiments. It is suggested that these activities be done as cooperative group projects, though under particular circumstances the teacher may wish to assign them to individuals. Since many of the experiments are conducted over relatively long periods of time, it may be very helpful to set up folders for each group (or individual) containing record sheets for experiments in progress.

Kindergarteners are included in the objectives for lower grades though it is recognized that for most kindergarten students this is quite a stretch. The expectation is that they will be exposed to the terms and concepts but they should not be required to master them. It is not recommended that kindergarten students be included in a one-room school with a wide span of grades unless additional support is available. Under these circumstances, and given the extensive use of hands-on activities, it is felt that kindergarten-aged children could benefit from and enjoy these lesson plans. Make modifications as necessary to meet individual needs.

Advance Planning

Prior to beginning this unit it will be helpful to accomplish the following tasks:

- Choose and identify a meaningful field trip to be taken at or very near the beginning of the unit. This provides students with a concrete experience on which they will be able to "hang" the information they will be learning throughout the unit. Many nature centers provide naturalists or even botanists who may provide a guided tour; however, these people are accustomed to having students take field trips as culminating experiences so it is helpful to confirm the appointment with a letter, thanking the person in advance and informing them that students will not have had instruction on the topic at the time of the field trip. I also like to let them know that we are from a Christian school and believe in a loving, creator God, and as such would appreciate it if they would refrain from evolutionary comments. Phrase this so that it serves as a sensitive and positive witness to the interpretive guide.
- Arrange for a guest speaker (or several) if you choose to do a plant careers day event at or near the conclusion of the unit.
- If you plan to do a plant fair displaying students' work and offering them the opportunity to explain what they have learned through the projects and experiments, schedule this and inform parents so that they can make arrangements to attend. Doing it during lunch hours may increase parental attendance.
- Put an announcement in your church bulletin asking members to save and/or donate any of the following items which you do not already have: seed and flower catalogs, seeds and bulbs, plant cuttings, cacti, carnivorous plants, plastic soda six-pack rings, potting soil, pots, a bag of raw unshelled peanuts (WalMart Superstores sell these), popsicle sticks and wooden shish kabob skewers, dried peas. Also ask for plant "experts" who would be willing to share their knowledge and expertise with your class
- Prior to the start of the unit prepare a small aquarium or other clear glass container and begin growing peanuts as described in Peanut Anatomy (appendix A) as they take about 3 months to mature.
- Several days in advance of each lesson plan ensure that all materials are ready.

Multi-grade Theme Unit: Plants

Resources:

Books for student use:

All About Seeds by Melvin Berger
An Ancient Forest by Guy J. Spencer
Apples by Gail Gibbons
Audubon Society Beginner Guides
Backyard Attractions: The Flower Garden by Brigid Gaynor (model for writing process)
Backyard Attractions: The Vegetable Garden by Brigid Gaynor (model for writing process)
Coniferous Trees by Wong, et al
Discovering Trees by Keith Brandt
Earthworm by Andrienne Soutter-Perrot
Eating the Alphabet by Lois Ehlert
field guides to trees, flowers, wild edible plants, plants, etc
Growing Vegetable Soup by Lois Ehlert
How New Plants Grow by Colin Walker
Let's Get Growing by Crow Miller
The Magic School Bus Plants Seeds by Joanna Cole
More than 100 questions and answers… by Martin Walters
Mysteries and Marvel of Plant Life by Barbara Cork
The Oak by Andrienne Soutter-Perrot
Plants: A Creative, Hands-on Approach to Science by Wendy Baker Plants: Poisonous Plants by Suzanne M. Coil (needed for lesson Day 22)
The Popcorn Book by Tomie de Paola
Protecting Trees and Forests by Usborne
The Reason for a Flower by Ruth Heller
Red Leaf, Yellow Leaf by Lois Ehlert
The Tiny Seed by Eric Carle
Trees, Leaves and Bark by Diane Burns
The Tremendous Tree Book by May Garelick
The World of a Tree by Allen Paterson

Big books

The Carrot Seed by Ruth Do Things Grow by Althea
Growing Vegetable Soup by Lois Ehlert
How Do Things Grow by Althea
The Reason for a Flower by Ruth Heller
Red Leaf, Yellow Leaf by Lois Ehlert

Read aloud books (K-4)

The Carrot Seed by Ruth Krauss
Dandelion Adventures by L. Patricia Kite
* The Empty Pot by Demi
The Garden in Our Yard by Greg Quinn

A Gift from the Trees adapted by Doe Boyle
* The Giving Tree by Shel Silverstein
Inch by Inch: the Garden Song by David Mallett
* Johnny Appleseed by Steven Kellog
Meeting Trees by Scott Russell
* Miss Rumphius by Barbara Cooney
My Plant by Herbert Wong
Our Terrariums by Herbert Wong
Picking Apples and Pumpkins by Amy and Richard Hutchings
Plants in Winter by Joanna Cole
The Pumpkin Book by Gail Gibbons (contains references to Halloween)
Rosa's Special Garden by Dale Fife
A Seed is a Promise by Claire Merrill
The Seed the Squirrel Dropped by Petie (oldie but goodie)
Song of the Seed by Cecile Lamb and Mildred Stagg
Springtime Tree Seeds by Helen Russell
* The Story of George Washington Carver by Eva Moore
The Story of Johnny Appleseed by Aliki
The Tiny Seed by Eric Carle
This Year's Garden by Cynthia Rylant
Tops and Bottoms by Janet Stevens
A Tree is Growing by Arthur Dorros
A Tree is Nice by Janice May Udry
* The Victory Garden by Jerry Pallotta and Bob Thomson

Read aloud books (5-8)
* George Washington Carver: The Man Who Overcame by Lawrence Elliott
* George Washington Carver: Mon's Slave Becomes God's Scientist by David Collins
* George Washington Carver, Plant Doctor by Mirna Benitez
* My Side of the Mountain by Jean Craighead George
* The Secret Garden by Frances Hodgson Burnett
* indicates books with strong lightskill connections

Guided reading books (K-2)
Autumn Leaves are Falling by Maria Fleming (Hello Reader Level 1)
Big Red Apple by Tony Johnston (Hello Reader Level 1)
Fall Leaves by Mary Packard (Hello Reader Level 1)
Fall Leaves Change Colors by Kathleen Weidner Zoehfeld (Scholastic Science Reader Level 1)
The Garden That We Grew by Joan Holub
Grow a Pumpkin Pie by Jane Gerver (Hello Reader Level 1)
I am a Leaf by Jean Marzollo (Hello Reader Level 1)
I'm a Seed by Jean Marzollo (Hello Reader Level 1)
* Johnny Appleseed by Eva Moore
Johnny Appleseed by Madeline Olsen (Hello Reader Level 1)
Fall Leaves Change Colors by Kathleen Weidner Zoehfeld (Scholastic Science Reader Level 1)

<u>Teacher resources and books helpful to direct instruction</u>:
Essential Guide to Natural Home Remedies by Penelope Ody
The Life Cycle of a Tree by John Williams
Now You Know: Plants and Their Seeds by Anne Neigoff
Plants that Never Bloom by Ruth Heller
Plants Without Seeds by Helen Challand
The Reason for a Flower by Ruth Heller
Why Do Leaves Change Color? by Betsy Maestro

Materials to collect in advance:
- seed and flower catalogs
- potting soil and pots
- gravel or small stones for drainage in plant pots
- seeds
- a variety of plants including, if possible, carnivorous plants, water plants and cacti

Materials to prep in advance:
- photocopy, staple and bind plant books/dictionaries as needed for various age groups
- plant peanuts in clear container before unit begins as they take time to mature
- folders for managing ongoing experiments
- arrange for field trip and guest presenters
- schedule plant show if planning to do one (see lesson plans Day 24)
- collect materials specified in lesson plans

Field trip ideas:
Arboretum
Nature center
Organic farm
Plant nursery
Vegetable farm
Wildlife refuge
Zoo (focus on ecosystem and interdependence between plants and animals)

Lesson Plans

Day 1: Field trip

Plan in advance a field trip to a meaningful site where students can be immersed in experiences related to plants. If the site is providing a tour guide, be sure to inform them in advance that students are coming at the beginning of the unit and explain why so that they do not have unrealistic expectations of students. Provide students with a method for collecting information offered at the site. Consider the accompanying form (field trip record sheet).

Day 2: Characteristics of plants vs. animals

Objectives:

- (K-8): Explain how plants differ from animals.
- (K-8): Identify the characteristics of plants (have cell walls, contain chlorophyll, are usually rooted or attached so they can't move freely, reproduction is a 2-stage cycle).

Materials needed:

Magazine pictures of various plants and animals **(provided),** microscope with slides of onion skin prepared in advance, blank Venn diagram forms, students' plant dictionaries

Introduction:

Have students in cooperative groups choose roles. Give each group pictures of plants and animals. Have each group divide the pictures into two separate piles (presumably they will separate them into plants/animals). In groups, have students list characteristics that make each group unique. Have reporters share a single characteristic in turn until all ideas have been exhausted.

Procedure:

Explain that scientists who have studied plants and animals have discovered that there are four ways that plants and animals differ (record these on chart paper): 1) plants are usually rooted to something and cannot move around freely while animals can move about (have kids try to think of examples that are inconsistent with this characteristic); 2) plants, like animals, are made of tiny building blocks called cells but the cells of plants contain a substance called chlorophyll which makes them green in color; 3) plants have a tough cell wall in addition to a cell membrane (provide groups with a microscope and prepared slide of onion skin to look at, noting the cell walls); 4) unlike animals, plants reproduce in a two-stage cycle.

Ask each group to create a chant, song or set of gestures that incorporate these four differences and be sure that each group member knows it. (Allow 10 to 15 minutes for this and support groups as needed.)

Evaluation:

In turn, have groups present their activity to the rest of the class.
Alternate or supplemental activity:

Have students work in pairs to complete a Venn diagram showing similarities and differences between plants and animals. For younger students, consider creating a large Venn diagram by taping two overlapping hula hoops to the chalk board. Print, laminate and place a magnet on the back of the pictures which are **provided**. Present them to the students one at a time and have them place them in the correct section of the Venn diagram.

Extension activity or additional day's lesson plan:

Day 3: Annuals/biennials/perennials; Vascular/nonvascular plants

Objectives:
- (K-4): Distinguish between annual, biennials and perennials.
- (5-8): Compare and contrast vascular and nonvascular plants.

Materials needed: (K-4) copies of flowering plants to be colored, craft sticks and wooden skewers, crayons, shoe boxes partially filled with sand or other medium, tape, students' plant dictionaries; (5-8) One copy of Explore God's Creation (8th grade NAD science text) per upper grade group, copies of graphic organizer labels and pictures (one per student), large sheets of paper (12"x18"), glue, students' plant dictionaries

Review and introduction:
Have all groups put their heads together to see if they can name the four characteristics of plants that distinguish them from animals. Explain that you will be drawing the names of students to tell the whole class one of the characteristics so each group needs to make sure that every member can list them all. Give students two to three minutes to review and practice. Randomly choose a student to do the task.

Procedure:
Regroup students by grades into two groups, lower and upper. Ask the upper grade students if anyone remembers from past science classes what annual, biennial and perennial plants are. Assist students in formulating correct definitions and help them to devise strategies to remember (annual is the shortest word and they are the flowers that last only 1 year or associate it with school annuals which are good for only 1 year; biennial starts with "bi" like bicycle which has 2 wheels- biennial flowers take 2 years to develop; etc.)

Explain to lower grade students that they will be working in groups to design 3 different kinds of gardens—an annual garden, a biennial garden and a perennial garden. Give them the pictures of various flowers (sorted by type) to color along with craft sticks and wooden skewers and tape. Students will accurately color the flowers, tape a stick to the back and "plant" them in the shoe boxes according to type. Then each group will work together to design a sign to go in front of their garden, explaining the type of flowers in it. (Assign corresponding page in plant dictionary as homework).

Once lower grade students are working independently, assist upper grade students. Have them read and discuss p. 137-139. Then explain that they will be making a graphic organizer to show the classification system for plants. Give each student a copy of the graphic organizer labels and the related pictures. They will need to use the information in the 8th grade text on pages 136-149. Have them sort the labels into levels (plants being at the top, divided into vascular and nonvascular, followed by vascular being divided into seed-bearing and non-seed-bearing. Then have them design the graphic organizer and paste pictures in the appropriate places (see teacher's key if necessary). Have students write brief description of each kind of plant. Keep for review purposes or display one on bulletin board. Have students add definitions to plant dictionary (consider for homework assignment).

Evaluation:
Have lower and upper groups present their work to other groups or the class as a whole, explaining what they learned.

Day 4: Trees/characteristics and examples of vascular and non-vascular plants

Objectives:

- (K-4): Distinguish between the two main groups of trees (deciduous and coniferous)
- (5-8): Compare and contrast vascular and nonvascular plants; identify several divisions of the plant kingdom; describe characteristics of bryophytes; identify examples of bryophytes; identify divisions of non-seed-producing vascular plants; compare and contrast club mosses, horsetails, and ferns; identify divisions of seed-producing vascular plants; compare and contrast conifers, cycads, ginkgoes, and flowering plants.

Materials needed:
Published dictionaries (not student made ones); index cards on which the words "deciduous" and "coniferous" have been written; pictures of deciduous and coniferous trees **(provided);** computers with downloaded program from the following Web site: http://cmap.ihmc.us/download/; printer; paper; colored pencils or crayons

Review and introduction:
Remind students of how they sorted the pictures of plants on the first day of instruction and that there are many ways to organize. Explain that today we are going to organize plants again, but in a new and specific way.

Procedure:
For this activity separate upper grade students from lower grade students and organize them into cooperative groups. Each group is going to have two tasks.
Using magazine pictures provided, have students watch as you sort the pictures by a simple method (green trees vs. fall colored trees or tall, medium and short). As you sort have students try to guess your "classification" system. Then sort the trees into two piles, deciduous and coniferous and have students try to guess this system. They may identify them as evergreen and "not evergreen". Ask students not to call out their answers until you indicate that you are ready for them to do so in order to provide those students who need it with more "think" time. Using published dictionaries, have lower grade students look up two words: coniferous and deciduous (give groups the word cards provided to make this task easier.) Once each member thinks they understand each word then they can "quiz" each other on it, taking turns listening to each other tell what each word means.

Meanwhile have upper grade students, in cooperative groups, research and record answers to the questions on the accompanying sheet. Exploring God's Creation is one resource which is readily available and helpful, though students should be encouraged to use encyclopedias and online resources as well.

Have all students rejoin you so that you may explain how to use cmap graphic organizer program available to be downloaded from the Internet (free for multiple computers). This is a simple program and should not take long to explain to students, though the teacher should familiarize him/herself with it in advance. Using this program or a similar one, have lower grade students work in cooperative groups to create a graphic organizer which compares and contrasts deciduous and coniferous trees. They should print it and illustrate it. Have upper grade students use this program or another one similar to create a graphic organizer which compares and contrasts vascular and non-vascular plants. They should also print and illustrate their organizer.

Evaluation:
Evaluate students using their graphic organizers. A rubric is provided.
See Day 5's optional activity involving upper grade students with grading of today's worksheet.

Day 5: Seed bearing/non-seed bearing and non-vascular plants

Objectives:

- (K-4): Understand that plants grow from seeds or spores; distinguish between seed-bearing and spore-bearing plants.
- (5-8): Identify divisions and characteristics of non-seed-producing vascular plants; compare and contrast club mosses, horsetails, and ferns; identify divisions of seed-producing vascular plants; compare and contrast conifers, cycads, ginkgoes, and flowering plants.

Materials needed:

Bibles; shopping bags for collecting plant specimens; clear contact paper; student dictionaries; if desired, yesterday's upper grade worksheets and answer keys.

Review and introduction:

Using a cooperative review structure, review terms and concepts studied in previous day's lesson. Have students choose cooperative roles. Tell them that today we are going to look at what makes a new plant. Give each group one of these passages of Scripture: Genesis 1:11-13 or Matthew 13:31, 32. Ask them what they learned about plants from this. While they may have many answers, help students to focus on these two points: 1) seeds grow into plants, and 2) plants make seeds that will make more of the same kind of plant. Explain that while most plants make seeds in order to make more plants, some do not. The ones that make seeds are called seed bearing, while those that don't are called non-seed bearing.

Procedure:

Have students think silently for about 30 seconds about how a plant that doesn't make seeds could make more plants. Have students share their thoughts in their cooperative groups. Then call upon students to share an idea which different group member had with the whole class.

Next, give each group a shopping bag and take them outside. They are to try and collect examples of seed bearing and non-seed bearing plants. They may have to bring only a part of some plants. Remind them that plants do not continuously produce seeds, so they may have to think about whether they've seen seeds on them before or not. (If the weather is uncooperative, you may want to collect these ahead of time.) Have students return to their cooperative groups and sort the plants they collected into two groups, seed bearing and non-seed bearing. Have each cooperative group choose one example from the two classifications of plants to share with the whole class and allow them to do so.

Show lower grade students how to press their specimens in clear contact paper to display them. Displays should be clearly labeled as to classification. Have upper grade students add the following words and definitions to their dictionaries using available resources to define them: bryophytes, mosses, peat moss, liverworts, club mosses, horsetails, rhizomes, rhizoids, ferns, frond, cycad, gingkoes and diffusion. If time permits, provide students with the answer key to yesterday's worksheet and, in cooperative groups, have them grade the worksheets. After you have graded them you can discuss with them whether or not you agree with their grades and why.

Ask all students to save and bring in seeds from foods which they have eaten at home. These will be needed for the lesson on Day 7.

Evaluation:
Evaluate students using their completed projects.

Day 6: Seeds

Objectives:
- (K-4): Identify parts of a seed.
- (5-8): Identify seed components and describe the function of each.

Materials: Explore God's Creation, (one copy for each pair of students); clay; lima beans; water; containers to soak beans; straight pins; strips of paper, approximately 1 ½" x 3";

Review and introduction:
Using a cooperative structure, review terms and concepts studied in previous day's lesson. Explain to student that today they will be learning more about seeds and the parts that make up seeds.

Procedure:
Pair up students heterogeneously within their cooperative groups. Give each pair several lima beans and a small glass of water. Have them inspect the lima beans to see what they look like, then put them in the glass of water to soak for a while. Suggest that they use Explore God's Creation, page 198 where they will find a diagram of the parts of the seed (Figure 8-21). In the glossary there are definitions for all of the parts. Have them look these up. The older students may need to simplify the definitions for the lower grade students to understand.

Next, give each person (or partners) some clay. They will use the clay to make their own relatively large (three to four inches) model of a seed and its parts. On strips of paper proportionate to the size of the model, they are to create labels with a description of the function of each part. Attach it to the model with straight pins. Again, the upper grade student may need to help the lower grade student with this part. When models are completed, have them do a "class tour" so that each student can see the others' work. Add new terms to plant dictionaries.

Have students look at the lima beans that have been soaking to see if there are any changes. Explain that tomorrow they will be looking at the bean in more detail to identify the parts in a real seed. Keep seeds in a safe place for tomorrow's activity.

Evaluation:
Evaluate students' models using the accompanying rubric. Plant dictionaries may also be used for evaluation.

Day 7: Seeds (monocot/dicot and seed dispersion)

Objectives:
- (K-4): Classify seeds into two groups, monocot and dicot; describe how seeds travel.
- (5-8): Identify the relationship between seeds and fruit; classify seeds into two groups, monocot and dicot; describe methods of seed dispersal.

Materials needed:
Soaked lima bean seeds from previous day's lesson; other seeds which students have brought in; dried corn, if possible, or other monocot seeds.

Review and introduction:
Using a cooperative structure, review terms and concepts studied in previous day's lesson. Explain that today they will be looking at the soaked lima bean to see the parts they included in the model they made. In addition they will be learning about two different kinds of seeds and how seeds get from the part of the plant where they are formed to the ground where they can grow.

Procedure:
Have students get the lima bean and working in the same heterogeneous groups as on previous day's lesson, have them peel off the seed coat, break it in half, find the cotyledons and the embryo. Have them verbally label the parts. Randomly call on a student to do this and have other students point to the part on their own bean as the one student describes the parts of his.

Now, working in their whole group, have students choose cooperative roles.
Explain that plants may be sorted and classified into two groups based on the kind of seeds they produce. One group of plants makes seeds that have only one cotyledon. These are called monocots. The other group of plants makes seeds that have two cotyledons and are called dicots. Show them an example of each. Explain that another way to decide if a plant is a monocot or dicot is by counting flowers. Flowers that have petals and stamens in groups of four or five are dicots. Flowers with petals and stamens in groups of three, six, or nine are monocots. Make appropriate math and spiritual connections (multiples of three, all dicots have a natural line of symmetry at which they can be broken in half and examined; these patterns reveal the activity of a predictable, reasoning Creator). Have students get the seeds they brought from home and provide additional seeds if necessary. Then, using cooperative roles, have students sort and classify seeds as monocot or dicot. After students have had time to complete this task, have the reporter from one cooperative group list each seed in his/her group's monocot collection. Have students in other groups check to see if they agree. Repeat until all seeds have been checked.

Have students put their heads together and discuss where they think seeds are actually formed in a plant. Have them share their answers and then clarify any misconceptions by affirming that seeds are produced in the flowers and the flower may develop into the fruit that we eat and which contains seeds for new plants. Ask students to think of examples of such (apples, squash and green beans).

Now that we know where the seed forms, and what its parts are, we have to figure out how the seed gets to the ground or even moved to a new location where it can grow. Have a quick think-pair-share time about this, asking students to brainstorm as many ways as possible that seeds might be moved from one place to another. As reporters share their ideas, list correct answers on the board. However, once a correct answer is written on the board it cannot be repeated. If necessary, ask students to brainstorm again, this time in groups of four.

Have students add new terms to their plant dictionaries.

Evaluation:
Evaluate students' work using their plant dictionaries and observations made during class discussions.

Day 8: Roots

Objectives:

- (K-4): Describe root functions; identify differences between root systems.
- (5-8): Explain root functions; describe tissue found in a root; describe root parts; distinguish between taproots and fibrous roots.

Materials needed:
Plants providing examples of tap roots and fibrous roots for each group; carrot; blue food coloring; water; container; small pieces of paper; a variety of root-type vegetables (one of each will do).

Review and introduction:
Use a cooperative structure to review terms and concepts studied in previous day's lesson. Tell students that today they will all be turned into a plant. First, have the upper grade students stand up front with their legs straight and together. They may not move or bend their legs. They are a tall plant, maybe a tree. But there is a problem. They have no roots. This actually makes two problems. First, if a strong wind blows…. (give them and gentle push), they will fall over (remind them that they may not move their feet of bend their legs). But, that's not the only problem. Without roots they can't get any minerals (that's like food to us) or water. How long do you think they would last without food and water? Why wouldn't they live without food and water? Have the lower grader students come up and choose an upper grade "plant" to join. The lower grade students will lie down on the floor holding onto the upper grade students' feet. They should try to support the upper graders so that when you push them again they won't fall. However, when you push, they will probably still fall. Why? (Because the roots don't go deep enough to keep from being pulled out with the plant/tree.)

Procedure:
Draw on the board an example of a taproot. The reason why the lower grade students couldn't keep the upper graders from falling is that they didn't go into the ground very far. The taproot goes as far down as the plant goes up, giving it a good anchor. The lower grade students were more like fibrous roots, whose job it is to collect water and minerals for a plant.

Have students look at the peanut plant started before the unit began or the roots of any other available plants, representing both types of roots. Draw a picture of each and describe it.

Have upper grade students read Exploring God's Creation pages 158-160 and answer the Review It questions on p. 161. Meanwhile with lower grade students, ask students to predict what will happen if a carrot is placed in a cup containing water and food coloring (dark blue). Discuss how plants absorb water and minerals. Explain that the carrot is the root of the carrot plant. Have students leave carrot in water for several hours and then remove. Cut off a small section near the tip of the carrot. The circle of blue dots indicates where water is being carried up into the plant. Continue cutting small sections to see how far the dye has been absorbed. While waiting for this take place have students brainstorm a list of roots that we eat. Assign each lower grade student to illustrate one or more of these roots on a small (approximately 4”x4”) piece of paper. Have students collect these individual pictures and assemble them to make one poster. Entitle it “Roots We Eat.”

Evaluation:
Evaluate lower grades students using their completed pictures. Evaluate upper grade students using the Review It questions.

Day 9: Stems

Objectives:

- (K-4): Describe how a stem functions.
- (5-8): Describe stem functions; describe the tissues that make up stems; distinguish between herbaceous and woody stems.

Materials:

A straw and a food storage container for each group, outdoor setting where students can collect various plants with stems, T-chart on board or chart paper, two stalks of celery, a woody stem, food coloring, containers for holding celery and flowers as they are tinted, bags for collecting plant specimens, a strip of thick white paper towel (approx. 4 ½" x 1"), a craft stick, a clothespin, a clear plastic cup, a white carnation for each cooperative group.

Advance prep:

Place a stalk of celery and the woody stem of another plant in water with food coloring so that students can see the effect during the class period.

Introduction:

Place a straw and a food storage container on each groups table. Ask them to consider these two items and the legs to their table. Think about the function of each and then decide what part of a plant compares to these three items (the stem—it provides support like the legs of the table, transports water like the straw and store food like the food storage container). Accept all reasonable answers.

Procedure:

Have students choose cooperative roles. Next have them collect plant samples from outside including the stems. Encourage them to collect some with woody stems without identifying them as such. When students return, have them place all their samples in the middle of the table and, following their cooperative roles, sort them according to type. Presumably they will sort into woody and herbaceous types. When sorting is complete have groups brainstorm names (classify) for the groups. Teach the names "woody" and "herbaceous".

Next show students some leaves and flowers in a pile, having been removed from their stem. Ask them what is missing and elicit from them that the stem provides support for the parts of the plant. Explain that the stem has two other functions. Place about an inch of water tinted with food coloring in a clear plastic cup. Have students predict what will happen if the end of the paper towel is placed in the water. Using the clothes pin, clip the strip of paper towel perpendicular to the craft stick and lay the stick across the top of the cup so that the paper towel strip touches the colored water, wicking up the water. Ask students how this relates to the stem in a plant (the stem draws water up to the plant). Next show them the stalk of celery and ask what it is usually used for (food). Explain that the stems of plants store food for the plant so that it can grow and reproduce.

Next, show students the stalk of celery which has been in the colored water. Show them the phloem, xylem, and protective tissue (see p. 159 of Exploring God's Creation). If a microscope is available, allow students to view a thin slice of a stem under it.

Have students return to groups. Provide each group with a white carnation, a vase or other container and water tinted with food coloring of their choice so that they can experiment with the process of tinting.

Evaluation:
Have students review in their groups the names of the two types of stems, the three functions of the stem and, for upper grade students, the names and related functions of phloem, xylem and vascular tissue. Using "numbered heads together," evaluate students' knowledge.

Homework:
Have students add newly acquired information in plant dictionary. Upper grade students may answer the Review It questions on p. 161 of Exploring God's Creation.

Day 10: Leaves

Objectives:
- (K-4): Describe the parts of a leaf; distinguish between the main leaf patterns.
- (5-8): Identify leaf parts; describe leaf structure; explain the importance of the stomata.

Materials needed:
K-4 Bags for collecting leaves, outdoor setting where leaves can be collected, magnifying lenses, paper, crayons, pencils, plant dictionaries.
5-8 Bags for collecting leaves, outdoor setting where leaves can be collected, magnifying lenses, Exploring God's World text one per pair, plant dictionaries; elodea plant (an aquarium grass available at pet stores) and microscope if possible.

Review and introduction:
Using a cooperative structure, review terms and concepts taught in previous lessons. Explain to students that today we will be learning about another important part of plants: the leaves.

Procedure:
Have students in cooperative groups choose roles. Working in these groups, have students go outside and collect at least 15 different kinds of leaves for their group (avoiding duplicates). Upon returning to the room, have the materials handler lay the leaves out on the table. The leader/encourager should facilitate a discussion about how to sort the leaves based on common characteristics. Have students in turn choose a leaf and decide which pile to sort it into until all are sorted. Have groups share the characteristics they used for sorting and the similarities and differences they noted.

Explain that scientists classify leaves in two ways: 1) by the number of leaves on a leaf stem— a single leaf per leaf stem is called simple and multiple leaves per leaf stem are called compound (relate to the concept of compound words—two words joined together) 2) by the shape of the leaf—smooth, serrated or lobed, and 3) by the vein pattern—palmate leaves have veins that branch out from a single point like the fingers of your hand; pinnately veined leaves have one main vein in the center of the leaf off of which smaller one branch; and parallel veined leaves have veins which all run in the same direction.

Have students in grades K-4 sort and separate leaves into piles which have the palmate, pinnate and parallel patterns and then make leaf rubbings with each type on a separate piece of paper. Have them label the three types. If time, have them create "finger play" to help them learn the names and meanings of the three types of leaves.

Meanwhile, students in grades 5-8 should "partner read" pages 168-171 looking for important words and recording them in plant dictionary. If possible, provide students with a leaf of elodea (an aquarium grass available at pet stores) and a microscope so that students can view the cells. Is the entire leaf green? Where is the coloring located? Have students make a drawing of what they see labeling the chloroplasts.

Evaluation:

K-4: Evaluate their leaf rubbings to see if students have sorted and recorded leaves correctly. Have the group perform their "finger play" if this task was included.
5-8: Have students complete worksheet 7:1-3 from the Explore God's World resource book either in class or as a homework assignment or answer the Review It questions on p. 171.

Homework:
Have students add leaf terms to their plant dictionary.

Day 11: Flowers

Objectives:
- (K-4): Identify parts of a flower.
- (5-8): Identify the parts of seed producing plants; identify flower parts; describe functions for each flower part; distinguish between complete and incomplete flowers; compare and contrast perfect and imperfect flowers.

Materials needed:
Fresh, complete flowers (those having sepals, petals, stamens, and pistils: alstromeria—best deal and available year round; lily, campanula, gladiolus), magnifying lenses, song lyric cards **(provided),** dissecting scalpel and pins if deemed appropriate.

Caution: Dissecting tools should be used only by those students whom you feel are capable of doing so safely and responsibly and only after teaching appropriate safety rules.

Review:
Have students choose cooperative learning roles and using "numbered heads together" review previously taught vocabulary and concepts.

Procedure:
Provide each group with a flower and using overhead transparency as a model, have students dissect (see the flower dissection procedure provided) and identify each part on the real flower. Discuss each part and its function as you dissect.

Teach the following song to the tune of Frere Jacques (use illustrated cards for teaching each verse). Have students point to the part being identified.

Sepals, sepals, cover petals,
Keep them safe, while they grow
The group is called the calyx
All around the petals
Often green, often green.

Inside the calyx are the petals
The part we love. Bees do, too.
The group is called the corolla
The crown of the flower
Often bright, often bright.

The stamen is the boy part
A long and slender stalk
Called a filament, has a sac
The sac is called the anther
It holds a lot of pollen
On the top, on the top.

The pistil is the girl part
Centered in the flower
A long, slender tube
Called the style
Below you'll find the ovary
Which contains the ovules
Stigma at the top, stigma at the top.

God, You're amazing
Very creative
Ideas galore, ideas galore
Can't wait to see the garden You have made in heaven.
Please come soon. Please come soon.

Following the above activity, explain to students that in tomorrow's class they will be creating a flower of their own. It must be a complete flower containing all the parts learned in today's lesson. Suggest that they think about what they want their flower to look like and what materials they will use to represent each of the parts.

Evaluation:
K-8 Have each group of students sing the song and point to the relevant part of the flower.
5-8 Have students label the diagram of a flower either in class or as homework.

Day 12: Flowers

Objectives:

- (K-4): Identify parts of a flower.
- (5-8): Identify the parts of seed producing plants; identify flower parts; describe functions for each flower part; distinguish between complete and incomplete flowers; compare and contrast perfect and imperfect flower.

Materials needed:
Various paper or soft plastic cups (clear, soft plastic cups would allow students to color one side with permanent markers while leaving the other side clear to reveal the inner parts of the flower), coffee filters, permanent markers or crayons, clay, pipe cleaners, construction paper, glue, tape, glitter (only for the brave hearted).

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Review:
Provide each group or pair of partners with the flower diagram used in yesterday's lesson. Have students sing the song while pointing to the parts of the flower as they are mentioned in the song.

Procedure:
Match up students heterogeneously in pairs (consider younger with older). Show students the materials that are available and remind them that the flowers they create must be complete flowers, meaning that they contain all of the parts. Each person in the pair may make their own flower in consultation with each other or they may make a single flower together. Remind them to refer to the diagram if needed.

Evaluation:
Use rubric to evaluate the flowers created by students.

Homework:
Have students add flower terms to plant dictionaries.

Day 13: Pollination

Objectives:
- (K-4): Identify the means and process of pollination.
- (5-8): Describe the process of pollination; describe sexual reproduction in flowering plants; distinguish between self-pollination and cross-pollination; define gametophyte and alternation of generation.

Materials needed:
A small dish or container filled with talcum powder, corn starch, flour, or cinnamon; cotton swabs.

Review:
Review by singing the previously learned song while pointing to the parts of the flower as they are mentioned in the song.

Procedure:
Adapted from:
http://smithsonianeducation.org/educators/lesson_plans/partners_in_pollination/index.html

1. Ask students to identify each plant part described below. (This step is further review. Eliminate if not needed or experiencing time constraints.)

- ⊙ Female and sticky or feathery to trap pollen (the stigma)
- ⊙ Female and holds up the stigma (the style)
- ⊙ Female and contains the egg-producing ovary (the pistil)
- ⊙ Male and produces pollen grains (the anther)

2. Show a photocopy or overhead transparency of Activity Page 1B. Have students study the line drawing of the bee. Ask them to identify the bee structure or structures that do the following:

- ⊙ collect nectar (proboscis)
- ⊙ may carry pollen (bristles, legs and baskets, head)

3. Choose two students to be flowers while the rest are bees. Give each "flower" a cotton swab and a small amount of "pollen" (talcum or other type of powder) in a container or dish. Instruct each member of the bee group to visit a flower and dip a finger into the "pollen" in the dish. At this point, ask the class to name the part of the flower that the bees touched (the stamen, which consists of the anther and the filament) to get the pollen on their fingers. Have them determine whether it is a male or female part (male). Ask the students what parts of the bees' "bodies" (represented by their finger) touched the stamen that could carry the pollen to the next plant. Ask what they were looking for when they got to the plant (nectar) and what appendage they used to get it (proboscis bristles).

4. Have each flower hold aloft a cotton swab. Explain that the bees have just visited one plant and will now move on to another plant of the same species. Instruct the bees to visit a different flower and rub some of the pollen they are carrying onto that flower's swab. Ask the students what part of the flower the swab represents (stigma) and whether it is a male or female part (female). Explain that this process, of pollen from one flower being used to pollinate another flower is referred to as cross-pollination.

5. Repeat the activity using a single "flower" to explain that some flowers can self-pollinate (they provide the pollen for themselves—the wind may move the pollen to the stigma or insects and bees may assist the task).

If weather and seasonal conditions permit, have students go outside to actually observe bees coming and going from flowers.

<u>Evaluation:</u>

- (K-4) Complete worksheet provided (see one adapted for K-1 and other for 2-4)

- (5-8) Complete worksheet (cycle in development of fruit)

Day 14: Germination

Objectives:
- (K-4): Explain the meaning and process of germination; know what seeds need in order to germinate.
- (5-8): Describe the process of fertilization and germination.

Materials needed:
Small, clear glass jars with lids, paper cups, dried peas, water, plastic container, plaster of Paris, mixing spoon, seeds for sprouting, commercially available sprouter or canning jar with a piece of nylon stocking to cover the top and to aid in rinsing sprouts; copies of worksheet, Steps in Reproduction of Flowering Plants

Introduction:
Have students choose cooperative learning roles. In groups, have them brainstorm a list of things they think that seeds need in order to grow. Have reporters share items one at a time in turn and have other group members indicate whether they agree or disagree by showing thumbs up for agreement, thumbs down for disagreement and thumbs sideways to indicate that they are unsure.

Procedure:
Explain to students that each group will be conducting an experiment to determine what seeds need to sprout and grow. Have kids put heads together in groups to see if anyone knows the scientific name for the process of seeds sprouting (germination). Depending on what things groups thought were needed for germination, it may be necessary to design additional experiments. Ask students if they know what is meant by the term "variable" in the context of experiments. Review the importance of changing only one variable. Assign groups to an experiment or allow them to choose. Have students in groups read and follow the directions for their experiment. Over the course of the next several days, provide time for students to make journal entries regarding the progress of their experiments or complete the experiment record form.

Have students in grades 5-8 read pages 198-199 in Exploring God's World. Then have them sequence the steps in the process of germination on the accompanying worksheet. Meanwhile, discuss with students the strength of a seed in the context of germination. Ask if they think that a seed could break through plaster. Have students assist you in the following steps:

Step 1: Put water in a plastic container and add plaster of Paris until lumps form.

Step 2: Stir the mixture and pour it into small paper cups.

Step 3: Stick a pea into the plaster and let it harden.

Step 4: Observe to see if the seeds break through.

(Consider using a variety of beans or seeds and observe to see which break through first. Consider if the size of the seed is related to the time which it takes to break through.)

Show students seeds for sprouting and begin the process so that they can observe and eat some if they choose.

Evaluation:
Use accompanying rubric to evaluate students work.

Day 15: Vegetative propagation

Objectives:

- (K-4): Understand that plants can be grown by means other than germination.
- (5-8): Understand that plants can be grown by means other than germination.

Materials needed:
See materials lists for accompanying experiments.

Review and introduction:
Have students choose cooperative roles. Review previously used terms and concepts using "numbered heads together" or other structure. Next, have students indicate their answer to the following questions with a "thumbs up", "thumbs down" or "thumbs sideways" (if unsure). Ask if a new plant can be grown from: a seed? a root? a flower? a stem? or a leaf?

Procedure:
Explain to students that they will be conducting experiments to see if new plants can be grown from various plant parts. Further explain that this is called propagation. Provide each group with one of the accompanying experiment sheets and the necessary materials. Have them work cooperatively to set up the experiment. Beware that the grafting experiment involves use of knife and cactus plants. Other experiments require the use of a sharp knife. Match experiments to students' maturity levels and provide appropriate supervision. Students may have time to set up more than one experiment. When done, students should check other ongoing experiments and record their observations.

Evaluation:
Evaluate students using the accompanying rubric and their plant dictionaries and experiment record sheets.

Day 16: Photosynthesis

Objectives:

- (K-4): Describe the process of photosynthesis; sequence the steps of photosynthesis.
- (5-8): Describe photosynthesis; identify the products of photosynthesis; distinguish between the light and dark reaction of photosynthesis.

Materials needed:

Either varying kinds of leaves or a place where students can collect them; rubbing alcohol; clear container, plant with one leaf wrapped (see advance prep); sauce pan; heat source to boil water; plant dictionaries; worksheet 8:1-3 for upper grade students.

Advance prep:

Several hours before class, place a fresh leaf in a clear jar with a small amount of rubbing alcohol (boiling the leaf first will speed the reaction). Two days in advance, wrap black plastic or other opaque wrapper around a leaf on a plant (geranium is suggested). Keep the plant in its usual environment.

Introduction:

Have students choose cooperative roles. Either supply each group with 6-10 different type of leaves or allow them to quickly collect them. Have them arrange them according to their shade of green from light to dark. Ask students why they think leaves have different shades. Do they think there is a connection between the location of the leaf on the tree (for example, in the top of the tree or in the shade) and the shade of green?

Procedure:

Explain to students that green plants do not have to eat, rather they are able, with energy from the sun, water, and nutrients from the soil, carbon dioxide from the air and a substance called chlorophyll, to make and store their own food for energy. In fact, most of what we eat is the energy they have stored. Teach that the term for this process in which plants make their own food is photosynthesis. Teach the root word meanings (photo—light and synthesis—to make something new from what already exists). Explain that chlorophyll, one of the ingredients necessary for photosynthesis to take place, is the green substance found in leaves. Show them the leaf from which chlorophyll has been extracted with rubbing alcohol and explain how it was accomplished.

Next, pick the leaf that was wrapped and another one from the same plant that was not. Dip both leaves in hot water, then place them in warmed alcohol and leave them. Explain to students that leaves need sunlight to make and store food in the process of photosynthesis. The food that they store is starch. Ask them to predict which leaf they think will contain more starch (the uncovered one). Tell them that iodine turns starch blue-black so it can be used to help us check our prediction. When both leaves are white, add iodine to each one and observe to see which contains starch. The wrapped leaf should not change color because it has been unable to make starch while it was kept in the dark.

Have students check ongoing experiments and record observations. Also have them add to their plant dictionaries the words “chlorophyll” and “photosynthesis”.

Homework:
Have upper grade students complete worksheet 8:1-3.

Evaluation:
Evaluate students using their plant dictionaries and experiment recording forms.

Day 17: Cell respiration

Objectives:

- (K-4): Describe cell respiration.
- (5-8): Describe cell respiration.

Materials needed: fresh leaves; microscope, one for each group or two; Elodea (an aquarium grass available at pet stores); test tube; glass funnel; wood splint; match; large wide-mouth jar

Review and introduction:
Using numbered heads together or other cooperative structure, review previously taught terms and concepts. Have students choose cooperative roles. Give each group one fresh leaf. Have them tear the leaf into two parts and look closely along the tear. They should be able to see a think film-like layer on the bottom side of the leaf. Provide each group or two with a microscope if possible to look at this thin layer. Once the microscope is focused, students should be able to see the stomata. Explain that these are tiny opening through which the plant breathes. During photosynthesis plants take in carbon dioxide and give off oxygen as a waste product. Ask them to think about how this reveals the work of God as a Creator. Each stomata is surrounded by two jelly-bean shaped cells called guard cells. These cells control the size of the opening. (Another way to view stomata is to paint a small section of the underside of a leaf with clear nail polish. When it has completely dried, peel the polish off by pressing transparent tape to it. Affix the tape to a slide and look for the imprint of the stomata in the polish—it is suggested that this be practiced ahead of time.)

Procedure:
Complete the following demonstrations with students. Fill the wide-mouth jar half-way with water. Put an Elodea plant in the jar of water. Put the jar in a sunny window and check it about every 30 minutes. You should see bubbles of oxygen rising in the water. Later put the jar in a dark place and check it about every 30 minutes. In the dark the plant is unable to continue with the process of photosynthesis so no oxygen is being produces as it was when the plant was in the light.

While waiting for the demonstration above, ask students to predict what would happen if petroleum jelly were spread on the underside of a leaf; the upper side of a leaf. Spread a thin layer of petroleum jelly on the bottom of several leaves and on the tops of several other leaves. Place the plant in sunlight and observe in two to three days. The leaves which were spread on the underside should be doing poorly while the others are doing reasonably well. Have students explain why.
Have students observe and record changes in ongoing experiments and add the word stomata to their plant dictionary. Consider having students draw a diagram of the leaf as seen under the microscope and label the parts.

Evaluation:
In cooperative groups, have students complete a Venn diagram comparing human respiration to that of plant respiration. Circulate among groups as they work.

Day 18: Transpiration

Objectives:

- (K-4): Explain transpiration.
- (5-8): Explain transpiration.

Materials needed:

A healthy tree or shrub; clear plastic bag; small pebble; twist tie; measuring cup.

Review and introduction:

Choose a cooperative structure to review previously learned terms and concepts. Ask students how water gets into plants (through the roots and then travels up the stem by means of phloem/xylem to the various parts of the plant). Remind them that this is called transpiration. Explain that during the process of photosynthesis the plant uses water but it has more than it needs so it gives off the extra water through the leaves. This is also called transpiration. We will do an activity which demonstrates this.

Procedure:

Choose a healthy tree or shrub. Put the plastic bag over a small twig which is covered with leaves. Drop the pebble in the bag so that the bag hangs down. Use the twist tie to secure the bag around the base of the twig. Explain that tomorrow we will check the bag to see if there is any water in it and how much. Have students predict how much water there will be. Why do they think God designed plants to do this? (When water evaporates, it changes from a liquid to a gas. The change uses up heat energy in the air, making the air cooler. Many liters of water can evaporate from a large tree on a hot sunny day.)

(A quicker alternative would be to use a small potted plant. Water it well then place plastic wrap around the base of the plant, covering the soil and pot. Put the plant in the sun and turn a gallon jar upside down over it. Within thre to four hours there should be evidence of water that has been excreted by the plant. Ask students to explain why it was necessary to cover the soil and pot.)

Allow students time to work on projects and to observe and record any changes in ongoing experiments, including those which were set up during yesterday's class.

Evaluation:

Evaluate students using their plant dictionaries and experiment recording forms.

Day 19: Spore-producing plants

Objectives:

- (K-4): Understand that many but not all plants grow from seeds; name two plants that grow without seeds and tell how each grows.
- (5-8): Distinguish between seed bearing and spore producing plants, identify characteristics that are common to non- seed-producing vascular plants.

Materials needed:

Moss and fern plants, magnifying lenses, microscope, glass slide, cover slip, eyedropper, small squares of paper (4"x4"); optional for lower grades: two hula hoops and prepared sentence strips (see explanation below).

Introduction:

Have students choose cooperative roles. Ask students to discuss in their groups if all plants grow from seeds. After allowing approximately 30 seconds for discussion, ask all students to respond on the count of three to the statement "all plants grow from seeds". They should respond with thumbs up to agree, thumbs down to disagree and thumbs sideways if unsure.

Ask younger students to listen for a minute (perhaps they will want to learn something the older students know) while you review the graphic organizer the upper graders constructed earlier in the unit. Remind students that plants are divided into two main groups, vascular and non-vascular, and that vascular plants are divided into seed bearing and non-seed bearing which means that not all plants grow from seeds. Further explain that plants which do not grow from seeds reproduce with spores. Spores are single cells that can reproduce new plants unlike seeds which come from two cells.

Procedure:

Give each group some fern leaves and moss and ask them to use a magnifying lens to see if they can see any spore cases. What shape are they? Have the recorders draw what they see. Explain the following differences and similarities between seed and spores: spores are much, much smaller than seeds (each black dot on the back of a fern is many spores); a seed contains a tiny, brand new complete plant including leaves but a spore does not contain its own little plant; a seed contains food for the plant to grow but a spore does not. Many seeds produce plants with flowers but spores do not. A spore is just one cell all by itself but seeds are made up of many cells. They are alike in that both have a sturdy covering to protect it, and both grow a plant just like the one they came from. For younger students write these traits on individual sentence strips. Form a Venn diagram using two overlapping hula hoops taped to a chalkboard or wall. Give students the sentence strips and in cooperative groups have them decide where to place each trait on the Venn diagram (if using a magnetized chalkboard put magnetic strips on the back of sentence strips). Require students who are older to complete a Venn diagram on paper.

Start a fern nursery, following these steps:

1: Fill a medium size pot with a half-and-half mixture of peat and sand. Moisten the soil so it feels damp.

2: Sprinkle spores collected from ferns on the surface of the soil.

3: Place the pot in a plastic bag and seal the bag to keep the moisture constant on the soil surface. (If it dries out, spray it lightly with a misting bottle.)

4: Place the pot in a north-facing window and observe frequently for growth.

5: When fronds begin to appear gradually acclimate the plant to conditions outside of the bag and then transplant it outdoors or into separate pot. The whole process will take about six months but will produce many fern plants. (The first leaves, called prothalli, have beautifully bright tissues under magnification.)

If time permits, have students use reference books to see how many different kinds of ferns they can view.

<u>Alternate activity:</u>
Using mushroom caps (domestic or wild), make spore prints (place the cap spore side down on a sheet of paper and cover with a bowl overnight; carefully lift the mushroom and spray the print with hairspray or other fixative (from a distance). <u>Be sure to explain that many scientists do not classify mushrooms as plants but they do reproduce by spores.</u> Also be careful about using mushrooms found in the wild so that students do not eat them, and have them wash their hands well after handling them.

<u>Evaluation:</u>
Have students put their heads together and, in turn, state something they learned today. Then have students in group one share what they learned with group two while students in group three share what they learned with group four (modify if you have fewer than four groups). Circulate, listening to students statements and correcting any misunderstandings.

Day 20: Tropisms

Objectives:

- (K-4): Describe types of plant tropisms.
- (5-8): Describe types of plant tropisms; analyze how plants have adapted to various environments.

Materials needed: maze, one on overhead transparency or a copy per group; copies of experiment sheets;

Review and introduction:
Use a cooperative structure to review terms and concepts previously taught. Have students choose cooperative roles. Either select one student to do the maze on the overhead transparency as students watch or have group members work together to complete the maze according to cooperative roles. Explain to students that just as they had to make many turns to complete the maze, so plants can change the direction of their growth in response to certain conditions in their environment. When plants change direction in growth this response is called a "tropism". We will be learning about four different kinds of tropism by conducting experiments.

Procedure:
Ask how many students have noticed plants that seem to be "leaning" toward the light. If you have examples in the classroom show them to students, turning them away from the light so that students can see the change in a few days. Explain that this is called phototropism because "photo" is a word that means light (give examples—photosynthesis, photograph). Explain that another tropism is called hydrotropism. Ask if anyone can predict what a plant might be moving toward in this case (water). A third tropism is geotropism which means that a plant's roots will always grow down and its stem will grow up. If the plant is turned the roots and stem will change direction. A fourth tropism is called thigmotropism which means that a plant may grow better in response to touch. If you have an example of this, show it to students or set up an experiment to test this tropism. Have students in groups set up experiments following the directions on the accompanying pages.

Evaluation:
Evaluate students using their completed experiment pages or the accompanying rubrics.

Day 21: Uses of plants by humans

<u>Objectives:</u>
- (K-4): Understand how plants are used by human beings.
- (5-8): Understand how plants are used by human beings.

<u>Materials needed:</u>

K-8 magazines or catalogs for cutting, large sheets of paper (12”x 18”), glue, scissors

<u>Introduction:</u>
Have students choose cooperative learning roles. Give each group a sheet of paper. In turn, have students quickly list products that are made from plants while the recorder writes or draws a quick sketch of the object. After two minutes, have reporters from each group stand and in turn call off one object that was on their list. Other groups cross off the same item if it is contained on their list. Continue until all ideas have been exhausted. Discuss any items students listed which are not really made from plants.

<u>Procedure:</u>
Have students work in groups to make a collage of items made from plants. Explain to them that the whole sheet of paper should be covered (no white showing) and that the pictures should be cut out neatly and be arranged artistically.

Evaluation:
Allow time at the end of class or the end of the day for groups to show their collages to the rest of the class. Use rubric if desired.

Day 22: Wild edible and poisonous plants

Objectives:

- (K-4): Identify 5 each poisonous and wild edible plants; know rules for plant safety.
- (5-8): Identify 5 each poisonous and wild edible plants; know rules for plant safety.

Materials needed:
Herbal teas (milk thistle, mint, dandelion, etc.), edible wild plants book (An Instant Guide to Edible Plants by Pamela Forey and Cecilia Fitzsimons published by Gramercy Books: New York is excellent.)

Introduction:
Explain to student that many plants around us are poisonous and we don't realize it because most of us wouldn't think of eating them. However, the same cannot be said for small children. Share with them some of the parts of common plants that can be poisonous (see Beware! Poisonous Plants by Integrated Thematic Units @ 1993 Scholastic, Inc.). Look to see if any of these are in the classroom. Explain that there are also many plants growing around us that are edible which we usually don't think of as sources of food.

Procedure:
Have students quickly choose a leader/encourager and reporter (rolling a die may facilitate this). Have students in cooperative groups brainstorm a list of common sense rules for plant safety (see list at end of lesson). Have them share their ideas, adding any that were not considered. Provide students with field guides and other books of wild edible plants. If the weather and season permits, take students outside to look for some edible wild plants. Bring them back and prepare them according to suggested ideas, allowing students to try some. If weather or the season does not permit students to collect plants with you, try to bring some in that you have collected yourself. Alternatively, show students various herbal teas and allow them to taste them.

Caution: Inform parents that students will be offered the opportunity to try edible wild plants. Ask them to inform you of any known allergies. It may be wise to ask for written permission. Make sure that you are confident in identifying those plants you will offer to students!

Some plants that may be easily available include the following with suggestions for use:

Lambs quarters: sauté in crushed garlic and oil and eat like greens.
Milkweed buds: boil and drain twice> Tastes something like broccoli or asparagus.

Violets: wash flowers and eat raw. These are high in vitamin C and taste like lettuce.

Dandelions: eat the flowers, being sure to avoid the sepals which are very bitter. Young leaves can also be eaten as greens.

Day lilies (sometimes called tiger lilies—the orange ones that grow by the road sides) use young crisp tubers raw in salads or boil and eat like potatoes. Buds can be cooked and eaten like green beans.

Burdock: roots of first year plants may be dug in late summer and fall. Peel and boil them, serve with butter or cut them into strips and boil they with a dash of soy sauce. Flower stalks can be peeled and eaten like celery.

Lady's thumb: young leaves can be used in salads or cooked and served like spinach.

Wintergreen: may be harvested all year. Pick the leaves to make tea. Fruits are best eaten after frost, either raw or in pancakes and muffins.

Smooth sumac: suck raw berries when they have a glazed appearance. Fruits can be steeped in water for 15 minutes then strained for a delicious drink. This should be consumed in moderation as some people show an allergic reaction.

Evaluation:

Have students in cooperative groups design a poster or pages of a book for each of several common sense rules about plant safety. (list taken from Poisonous Plants by Suzanne M. Coil (Franklin Watts 1991).

1. Know which plants in your house and garden are poisonous.

2. Never put any plant or plant part in your mouth unless it is commonly used for food (some plants commonly used for food must be cooked first!).

3. Don't eat any unknown berries, even if you see birds or other wildlife eating them.

4. Don't eat the seeds of any plant unless they are commonly used as food (some of these seeds may need to be cooked first).

5. Don't eat the bulbs, roots or tubers of unknown plants, especially if they look like onions.

6. Don't eat wild mushrooms.

7. Don't eat or touch plants that ooze colored or milky juice.

8. Don't burn unknown plants. Don't use unknown twigs to roast hot dogs or marshmallows over your campfire. Don't cook food over fires containing the branches or leaves of unknown plants.

9. Don't leave dangerous house or garden plants where small children or pets can reach them.

10. Store bulbs and seeds where small children cannot reach them.

11. Know how to contact your local poison control center in case someone is at risk of accidental poisoning.

Day 23: Plant related careers

Objectives:

- (K-4): List biological careers; provide opportunities for exposure to careers in the biological sciences.
- (5-8): Explain the importance of life science; identify branches of life science; list biological careers; explore careers in the biological sciences; critique racial and gender biases as they relate to life science careers.

Materials needed:
none

Introduction:
Explain to student in advance that one or more guest speakers who have careers related to plants will be coming to make a presentation. Review with them procedures for guest presenters (e.g., identify a student or two to meet the guest and assist him/her in finding the classroom or bringing in materials, use active listening, hold questions until the guest asks if there are questions, etc.). Have students in cooperative learning groups brainstorm questions they would want to have answered by the particular professional who has been invited. Remind them that they will need to be listening to make sure that the person has not already answered their question before they ask it.

Procedure:
In advance, invite one or more guests from the following list to speak to students about his/her career. Consider inviting a group of guests who might participate in a mini career day. Set up tables and ask each presenter to bring tools, pictures or other items representing his/her job and have students rotate through stations.

Possible guests:
Tree surgeon, soil scientist, flower designer, forestry worker, mushroom hunter, landscape architect, park ranger, medical researcher, chef, seaweed harvester, nursery worker (horticulturist), greenhouse manager, artist/photographer, organic farmer, orchard worker.

Evaluation:
Have students take notes or draw pictures representing things they learned or found interesting; or have students choose a plant related career and make a poster explaining what they know about the training and responsibilities of the worker.

Name ____________________ grades 5-8

Field Trip Record Sheet

Big ideas	New words
Something I saw	**Things I want to know**

2-4

Name ______________________

Field Trip Record Sheet

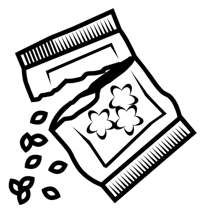
Something I learned ______________________ ______________________ ______________________ ______________________	Something I learned ______________________ ______________________ ______________________ ______________________
New words ______________________ ______________________ ______________________ ______________________	New words ______________________ ______________________ ______________________ ______________________
Something I saw	Something I saw
Something I want to know ______________________ ______________________ ______________________ ______________________	Something I want to know ______________________ ______________________ ______________________ ______________________

Name ___________________

k-2

Things I saw	Things I saw
Things I saw	Things I saw
Things I saw	Things I saw

My
Plant
Book





by ______________

Animals Plants

Move about	Can't move
Many colors	Green
Cells don't have walls	Cells have walls

Annuals

Grow and flower	Die

Biennials

Plant grows first year	Flowers grow next year

Perennials

Grow first year	Keep coming back

Two Kinds of Roots

Tap root
Fibrous root

Parts of a plant

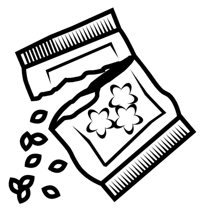
Two Kind of Trees

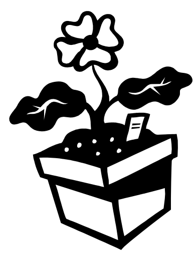
Conifer
Deciduous

Things Plants Can Do:

Make their own food
Grow toward light
Grow up when planted upside down

My
Dictionary
Of
Plant Terms






By ________________

Table of Contents

General Terms

annual: ____________________________ ____________________________ ____________________________ ____________________________
biennial: ____________________________ ____________________________ ____________________________ ____________________________
perennial: ____________________________ ____________________________ ____________________________ ____________________________
____________________________ ____________________________ ____________________________ ____________________________

General (continued)

Seeds

embryo __________________________ __________________________ __________________________ __________________________
cotyledon __________________________ __________________________ __________________________ __________________________
seed coat __________________________ __________________________ __________________________ __________________________
germinate __________________________ __________________________ __________________________ __________________________

Seeds (continued)

dicot ____________________________ ____________________________ ____________________________
monocot ____________________________ ____________________________ ____________________________
____________________________ ____________________________ ____________________________
____________________________ ____________________________ ____________________________ ____________________________

Roots

Stems

Leaves

Flowers

anther ______________________________ ______________________________ ______________________________
filament ______________________________ ______________________________ ______________________________
pistil ______________________________ ______________________________ ______________________________
ovary ______________________________ ______________________________ ______________________________ ______________________________

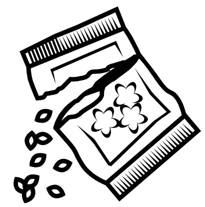
Flowers (continued)

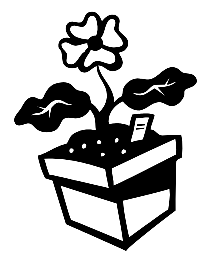
sepal ______________________________ ______________________________ ______________________________
stamen ______________________________ ______________________________ ______________________________
stigma ______________________________ ______________________________ ______________________________
style ______________________________ ______________________________ ______________________________ ______________________________

Processes and Responses

photosynthesis __________________________ __________________________ __________________________
phototropism __________________________ __________________________ __________________________
geotropism __________________________ __________________________ __________________________
__________________________ __________________________ __________________________ __________________________

My
Dictionary
Of
Plant Terms





by ____________________

Table of Contents

General

Seeds

Roots

Stems

Leaves

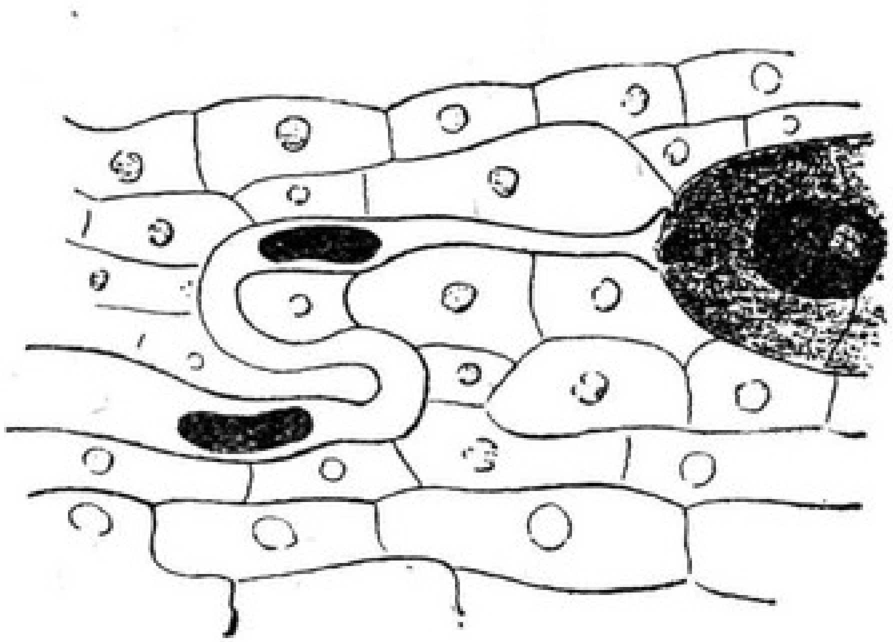
Flowers

Reproduction

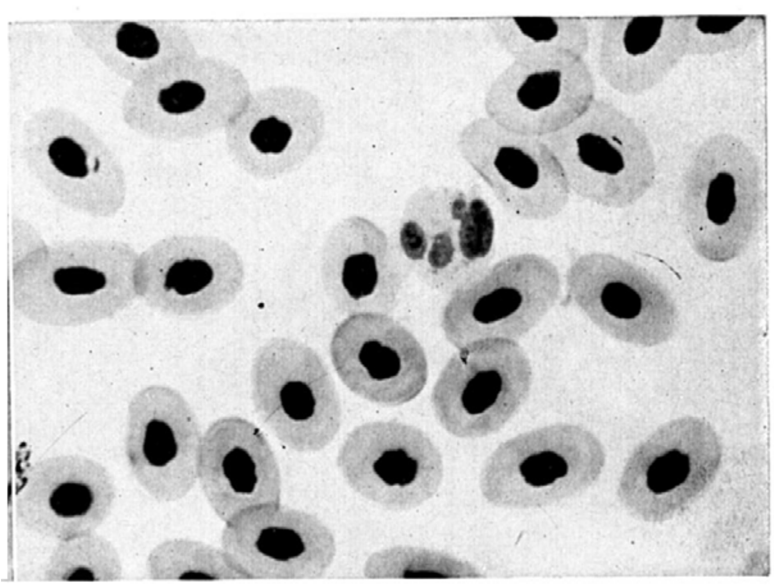
Processes

Responses

Plant Cells



Animal Cells



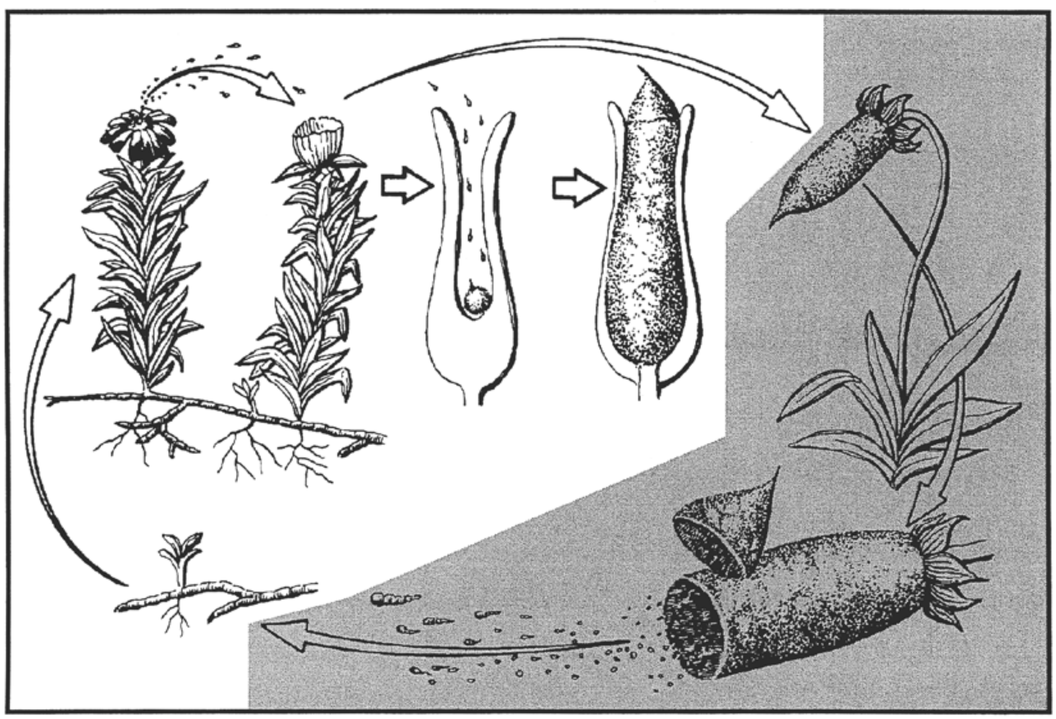
Overhead Master 6–1A

Differences Between Plants and Animals

PLANTS	ANIMALS
• Cells have a tough cell wall, in addition to the cell membrane.	• Cells have only a cell membrane.
• Cells contain chloroplasts, tiny organelles that contain chlorophyll, a green pigment.	• Cells do not contain chloroplasts or chlorophyll.
• Usually rooted or attached to something and cannot move around freely—immobile.	• Usually free to move from place to place—mobile.
• Reproduction occurs in a two-stage cycle called alternation of generation.	• Reproduction does not occur in two stages.

Overhead Master 6–1B

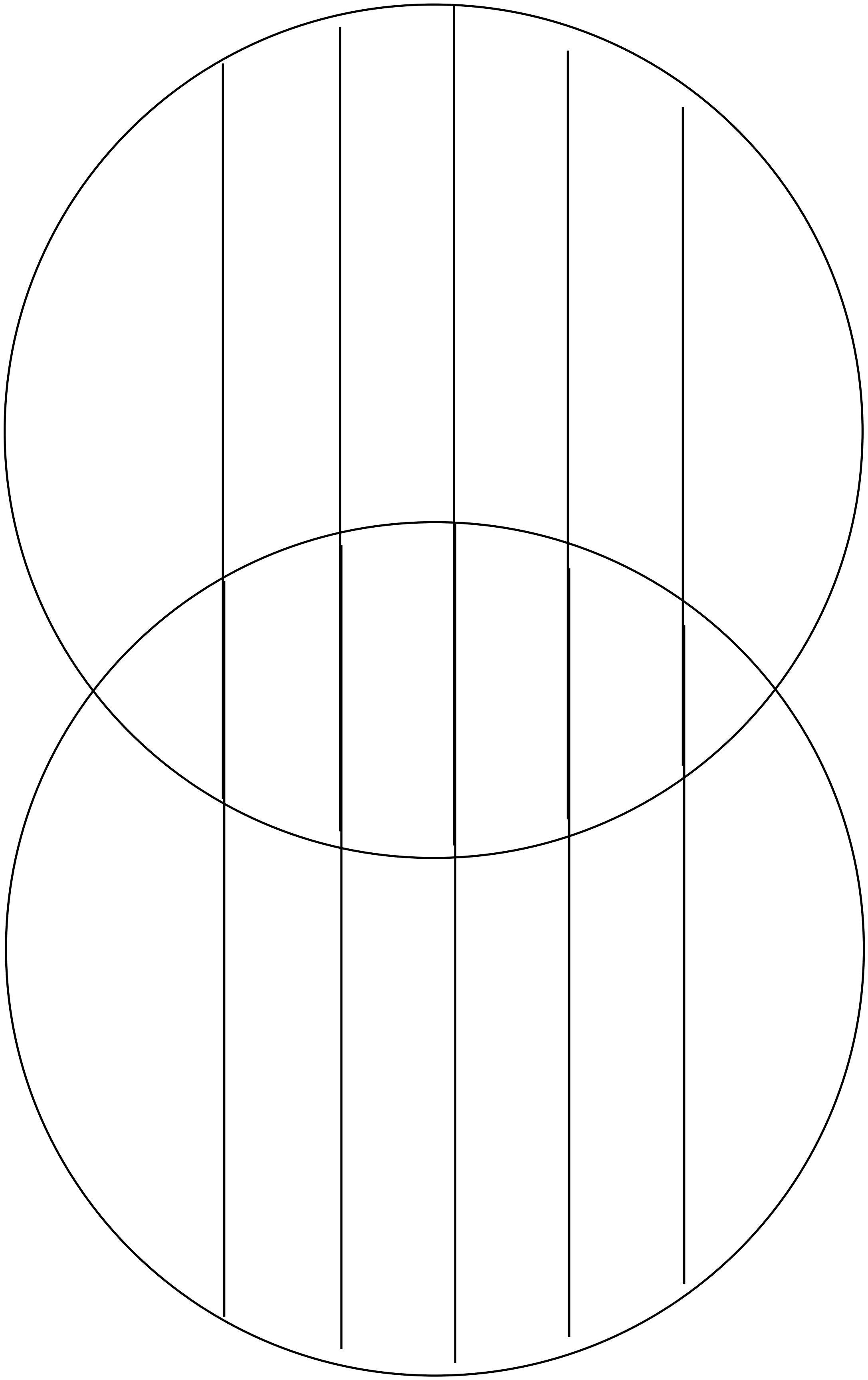
Alternation of Generation



Name ______________________

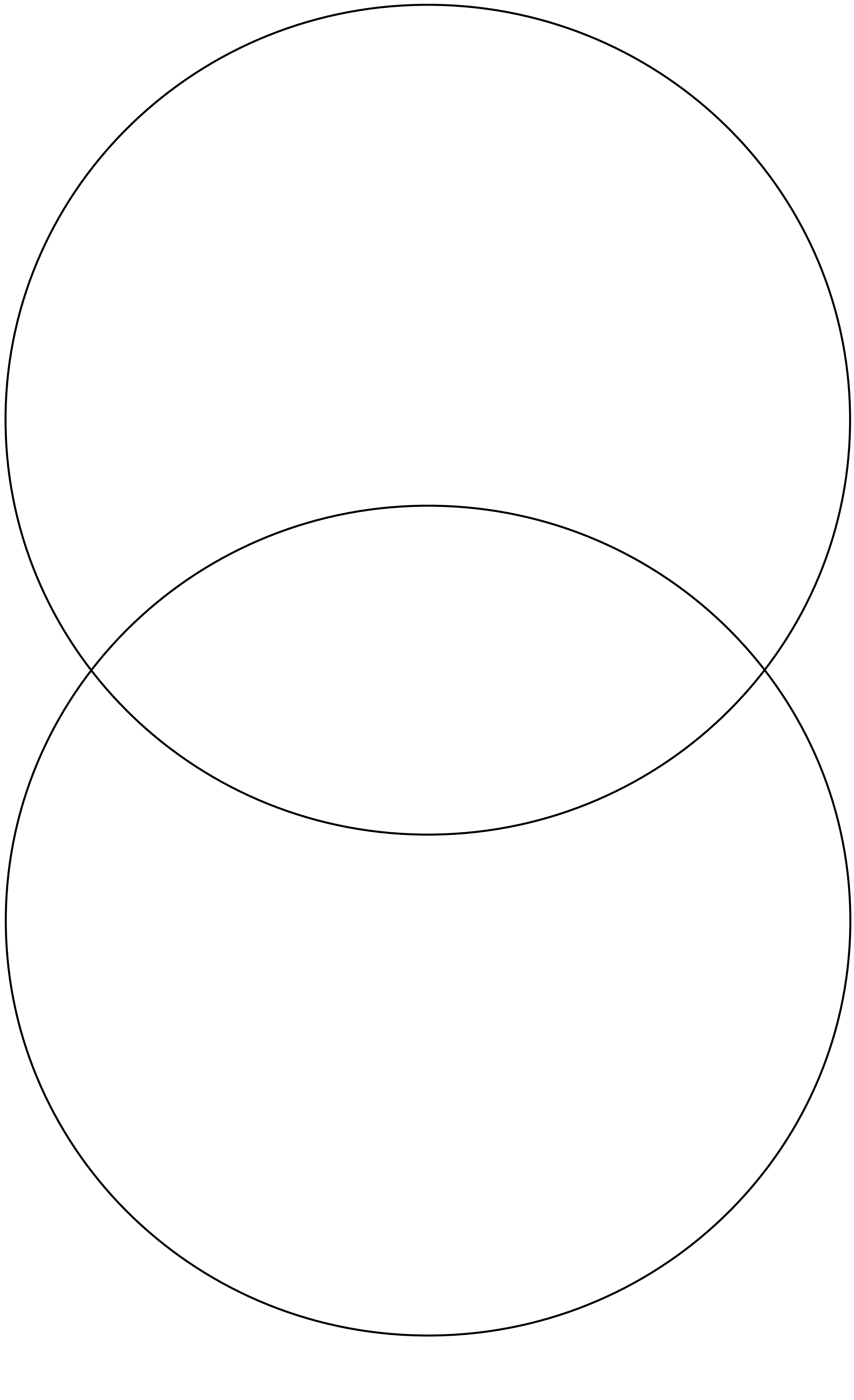
Subject ______________________

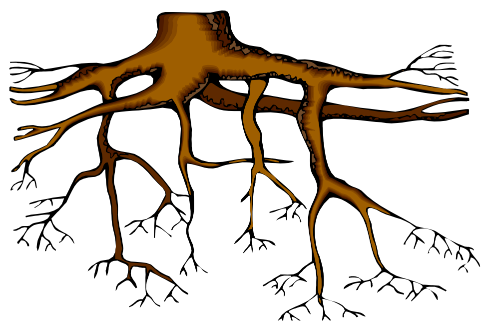
Subject ______________________



Name ____________

Venn Diagram



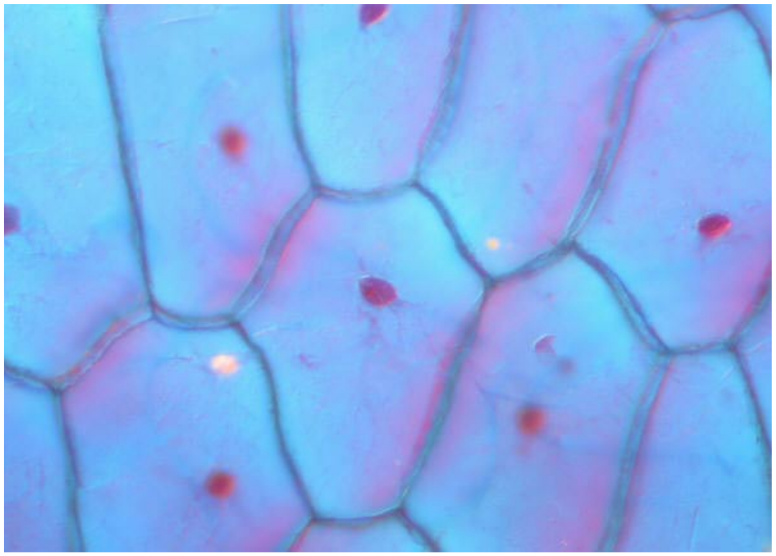


Have roots and can't move

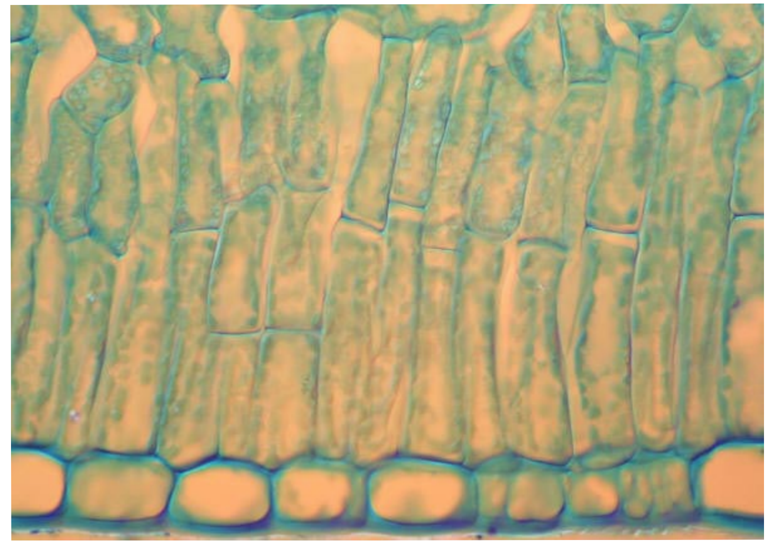
Have feet (wings, fins)
and can move

Have green leaves
Because of chlorophyll

Brown, green, blue,
red, black, yellow-
NO chlorophyll

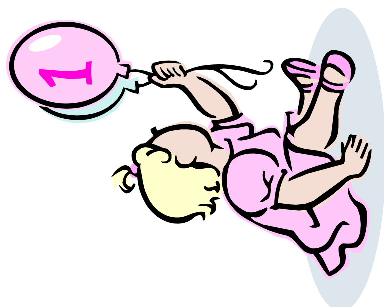


Cells have a wall and are "stiffer"

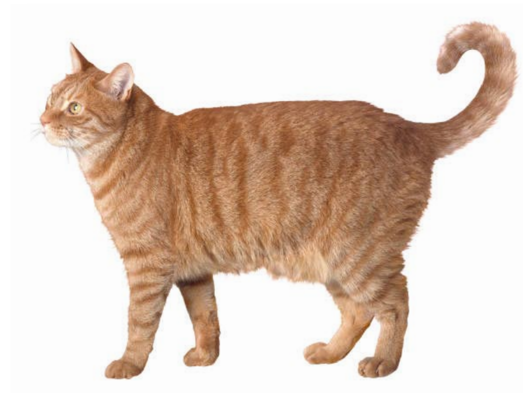


Cells have a membrane and are "softer"

alive



grow



Plants

Animals

Both

Snapdragon
pink, red,
yellow, white

Annual








Nasturtium
orange

Annual








Zinnia
white, pink
red, purple

Annual






Morning Glory
white, red, pink
purple, blue

Annual








Marigold
yellow or
orange

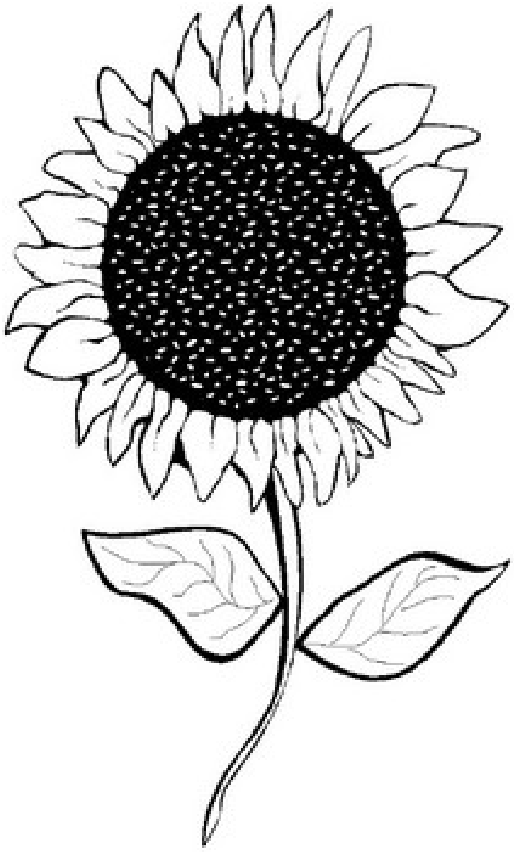
Annual





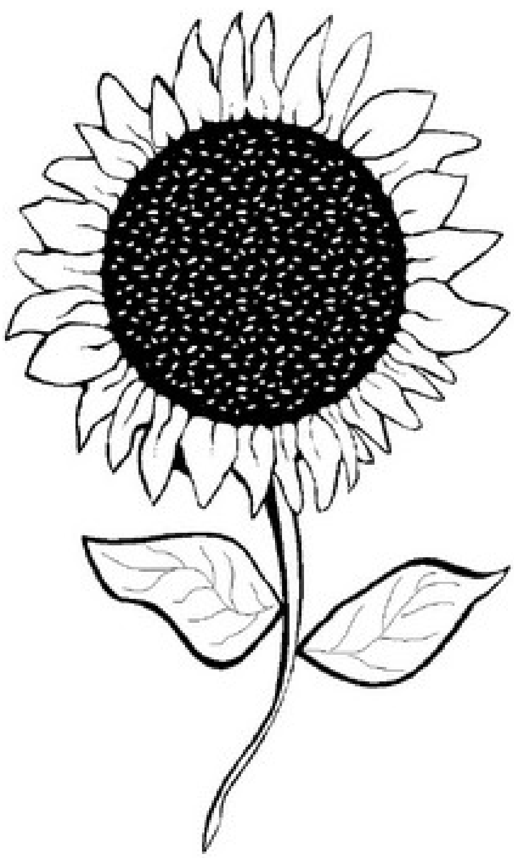


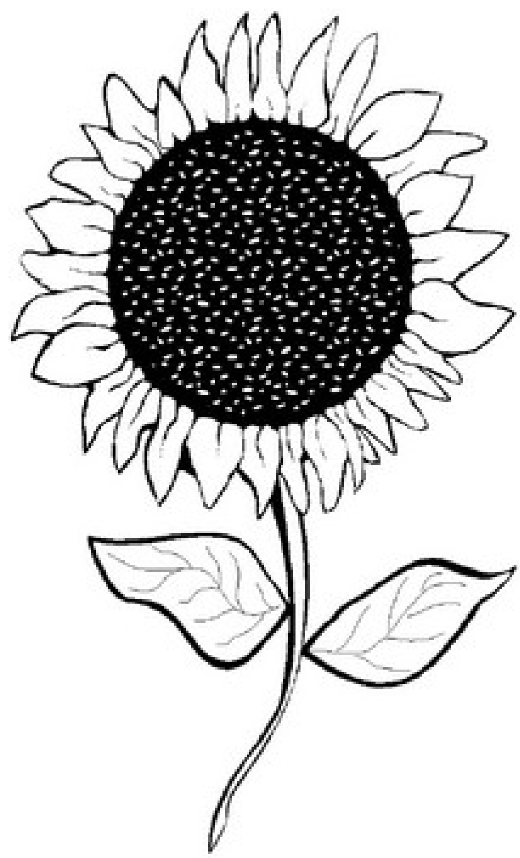




Sunflower
yellow

Annual






Foxglove
purple, pink
white, yellow

Biennial


Hollyhock
red, pink,
purple
yellow, white
Biennial

Pansy
white
yellow
purple

Biennial

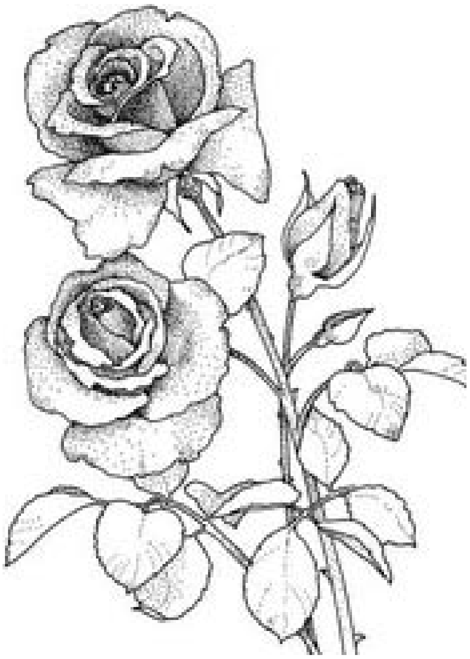
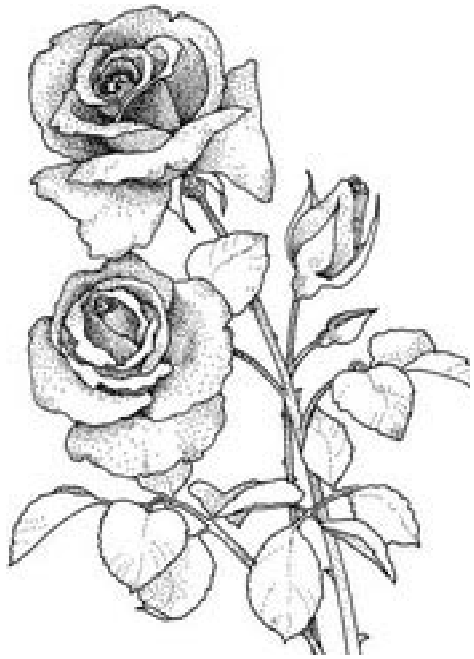
Black-eyed Susan
yellow with
black center

Perennial

Peony
pink, white
dark pink

Perennial



Rose
red, pink
white, yellow

Perennial


Carnation
pink, red
white

Perennial

Aster
purple

Perennial



Tulip
red, yellow
pink, white
orange

Perennial




Iris
white, purple

Perennial

Violet
white,
purple

Perennial



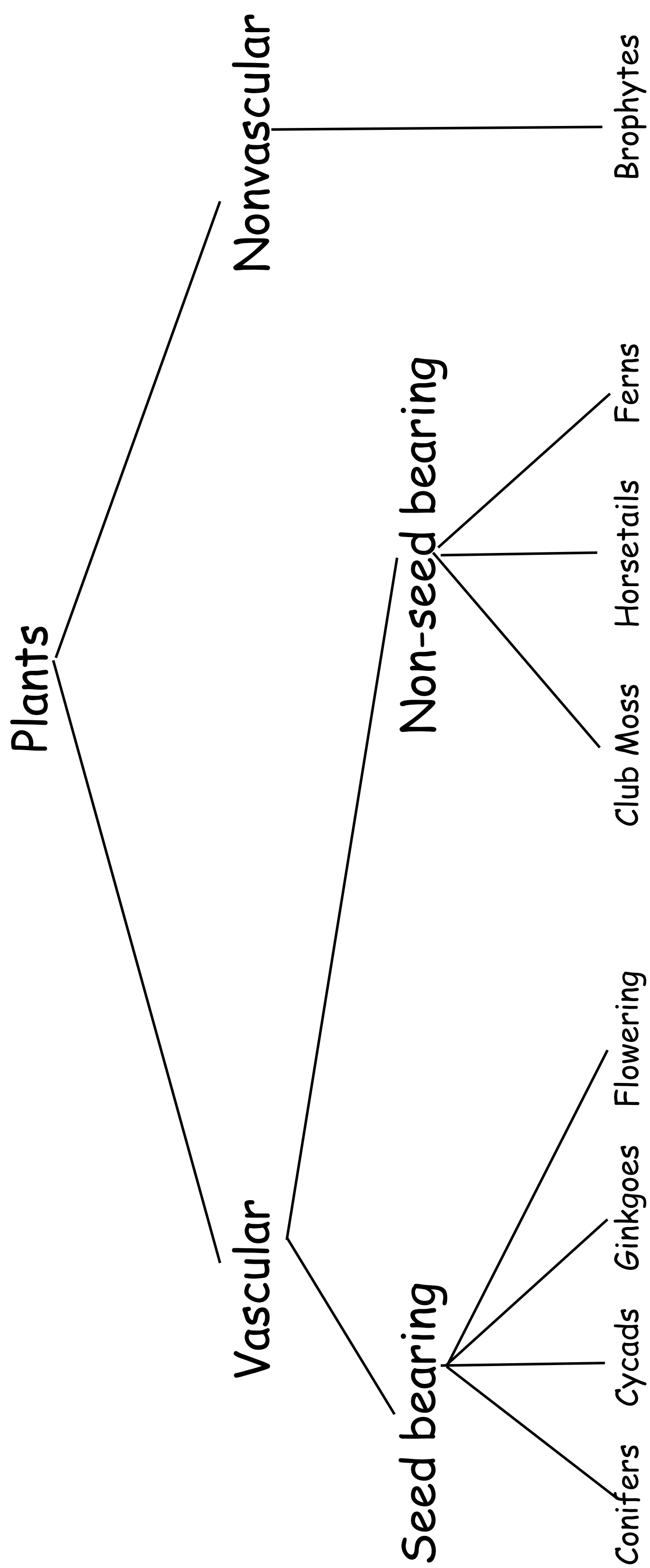



Lily
pink, white
orange

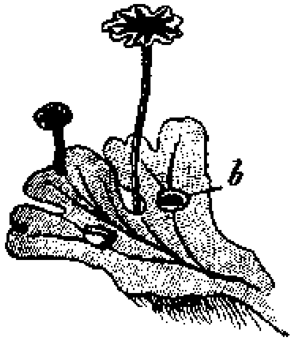
Perennial

Forget-Me-Not
light blue
yellow center

Perennial


Plants
Nonvascular
Brophytes
Vascular
Non-seed bearing
Ferns
Horsetails
Club Moss
Seed bearing
Flowering
Ginkgoes
Cycads
Conifers

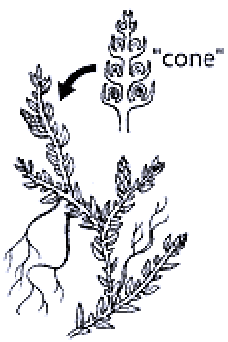
Divisions of the Plant Kingdom



Bryophytes

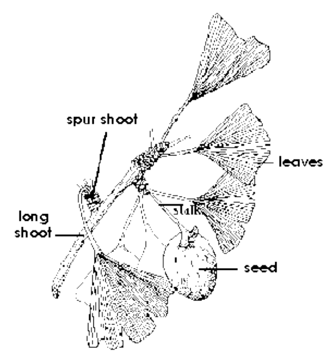
Cycads

Ferns



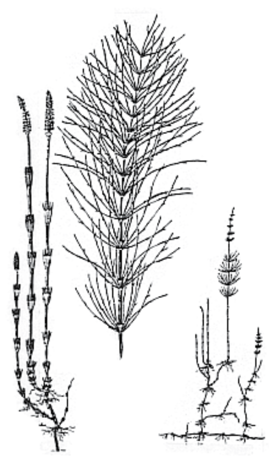
Selaginella

Club Mosses



Ginkgoes

Conifers



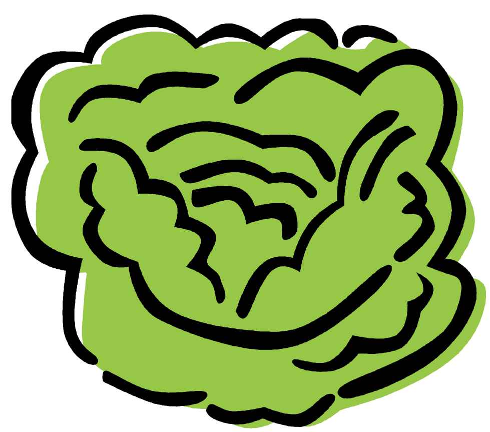
Horsetails

Flowering Plants

One, Two, Forever

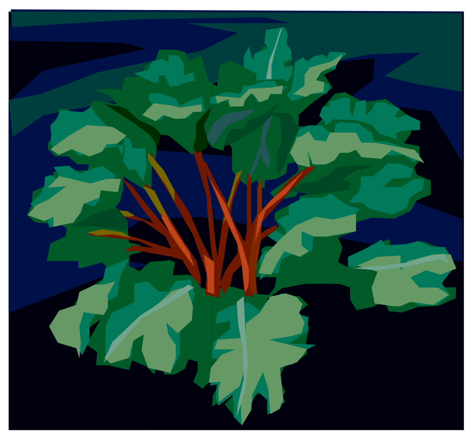
Sung to the tune of "Here We Go Round the Mulberry Bush"

Annuals grow for just one year,
Just one year, just one year.
Annuals grow for just one year,
Then they die.



Biennials take two years to grow
Two years to grow, two years to grow.
Biennials take two years to grow,
Then they're grown.

Perennials come back every year,
Every year, every year.
Perennials come back every year
For a long, long time.



Graphic Organizer Labels

Plants

Vascular

Non-vascular

Seed bearing

Non-seed bearing

Bryophytes

Club Moss

Conifers

Cycads

Ferns

Flowering

Ginkgoes

Horsetails

Name(s) ___________________________ Day 4 (Grades 5-8)

Research and record answers to the following questions.

1. What do the terms vascular and non-vascular mean?

2. Why do some plants have vascular tissue?

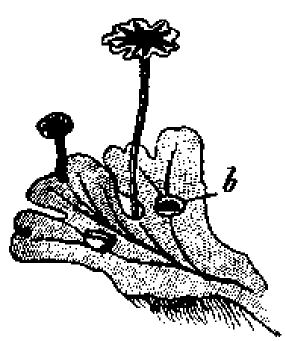
3. Where is this vascular tissue in those plants?

4. What is a bryophyte? Name three examples.

5. How do the plants that don't have vascular tissue survive?

6. Name one type of vascular plant that you can find either in/around your home or in/around school. (Try to make it a different one for each person).

7. Name one type of non-vascular plant that you can find either in/around your home or in/around school. (Try to make it a different one for each person).



Name(s) ___________________________ Day 4 (Grades 5-8)

Research and record answers to the following questions.

1. What do the terms vascular and non-vascular mean in the context of plants?
They refer to two types of tissue found in plants. Vascular tissue contains tube-like cell that carry water, dissolved minerals and sugar throughout the plant, in a manner similar to that of blood vessels in the human body. Nonvascular plants do not have tube-like cells so they must absorb water directly from their surroundings, much as a sponge absorbs water.

2. Why do some plants have vascular tissue? **In order to carry water and nutrients throughout the plant**

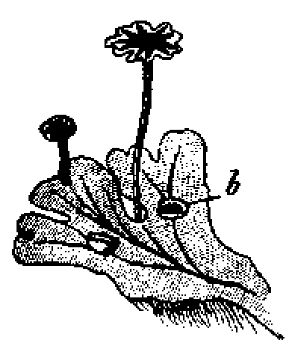
3. Where is this vascular tissue in those plants? **In the roots, the stems or woody parts of plants, leaves and flowers (throughout the whole plant)**

4. What is a bryophyte? Name several examples.
The plant division into which nonvascular plants are classified. Bryophytes include mosses, liverworts and hornworts.

5. How do the plants that don't have vascular tissue survive? **They tend to live in damp environments where they can absorb water easily. The water and nutrients move from one part of the plant to another by diffusion (the passive back and forth movement of materials through a membrane).**

6. Name one type of vascular plant that you can find either in/around your home or in/around school. (Try to make it a different one for each person).
(any kind of tree or plant with the exception of mosses, liverworts and hornworts)

7. Name one type of non-vascular plant that you can find either in/around your home or in/around school. (Try to make it a different one for each person). **Any examples of mosses, liverworts and hornworts**



Graphic Organizer Rubric

Content: The graphic organizer contains accurate and adequate information.	1 point: The graphic organizer contains inaccurate or inadequate information.	2 points: The graphic organizer contains an adequate amount of accurate information.	3 points: The graphic organizer is accurate and contains a great deal of detail.
Appearance: The graphic organizer is neat and visually appealing.	1 point: The graphic organizer appears to have been hastily constructed. The hard copy is wrinkled or ripped and/or the illustrations are non-existent or of inadequate quality.	2 points: The graphic organizer is neat and the hard copy has been cared for. The illustrations are adequate.	3 points: The graphic organizer is neat and the hard copy has been cared for. The illustrations are outstanding for this student's ability.
Cooperative Learning: The student worked cooperatively with the group and contributed her/his fair share of the work.	1 point: The student was involved in unnecessary conflict and/or s/he contributed less than her/his share of the work.	2 points: The student worked cooperatively with the group and s/he contributed her/his fair share of the work.	3 points: The student worked cooperatively with the group and actively sought to encourage teammates. S/he contributed her/his fair share of the work.

Scores

Students:	Content	Appearance	Cooperative Learning

Seed Model Rubric

Content: The seed model contains three parts (embryo, cotyledon and seed coat) and the labels are complete and accurate.	1 point: The seed model is incomplete and/or the labels are incomplete or inaccurate.	2 points: The seed model is complete with a label for each component. The label is accurate and reasonably complete.	3 points: The seed model is complete with a label for each component. The label is accurate and fully detailed.
Appearance: The seed model is neat and labels are carefully written with attention to writing mechanics (capitalization, punctuation, spelling).	1 point: The seed model appears to have been hastily constructed and/or the labels are poorly written, failing to meet individualized expectations.	2 points: The seed model is neat and the labels are carefully written. Writing mechanics do not meet individualized expectations.	3 points: The seed model is neat and the labels are carefully written. Writing mechanics meet individualized expectations.
Lightskills Use: The student worked cooperatively with her/his partner and actively sought opportunities to use lightskills.	1 point: The student was responsible for unnecessary conflict and/or failed to use lightskills when opportunities to do so existed.	2 points: The student worked cooperatively with her/his partner and took advantage of some opportunities to use lightskills.	3 points: The student worked cooperatively with her/his partner and actively sought opportunities to use ligthskills, helping to create a healthier, more peaceful environment.

Scores

Students			

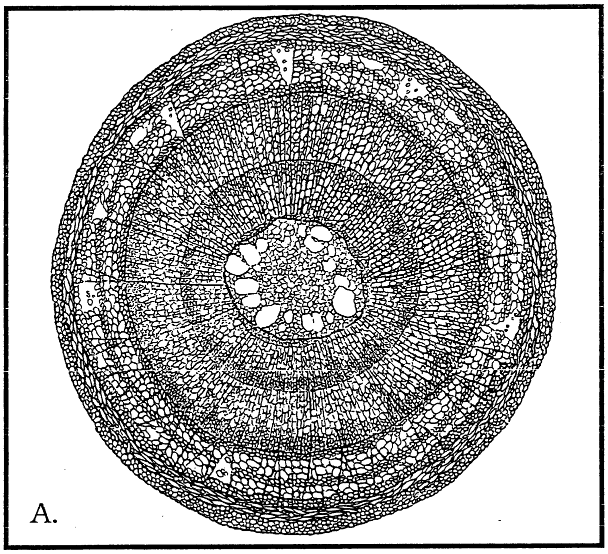
Worksheet 7:1–3

Name____________________

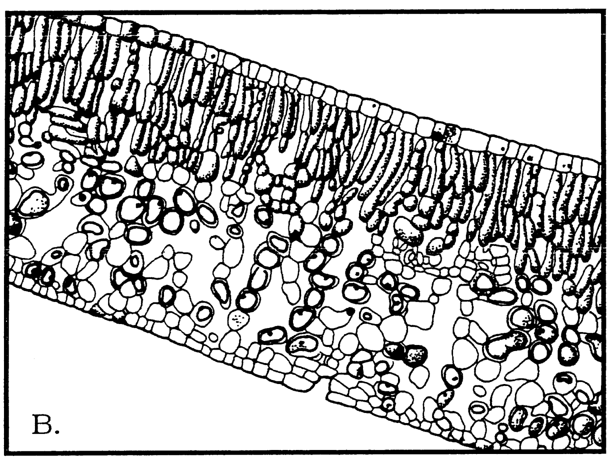
1. Color the three diagrams according to the color key below.

Color Key

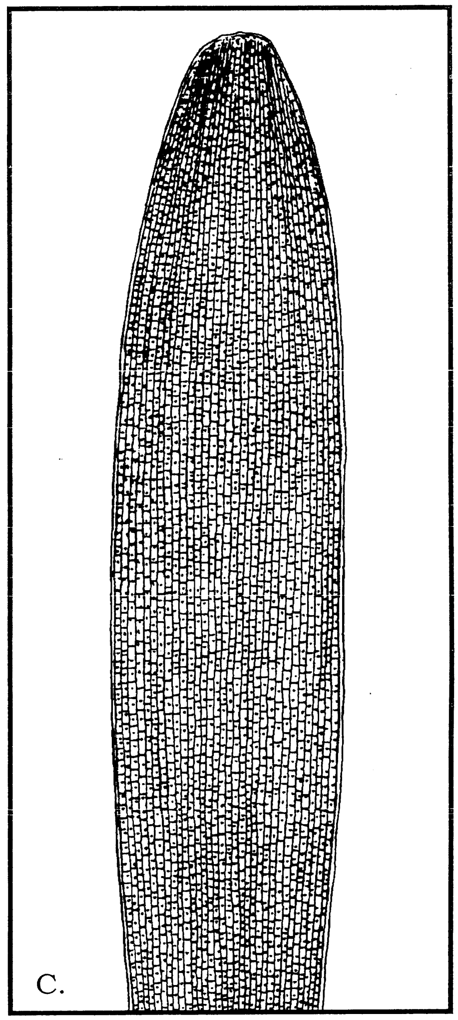
cambium =	brown	phloem =	green
cell division region =	pink	root cap =	purple
elongation region =	gray	specialization region =	blue
guard cells =	yellow	spongy cells =	light green
palisade cells =	tan	xylem =	red



A.



B.



C.

2. List three characteristics for each type of stem.

Herbaceous stem	*Woody stem*
______________________	______________________
______________________	______________________
______________________	______________________

Flower Dissection

Students will learn
* the parts of the flower
* the differences in male and female anatomy
* to determine if there are any advantages in fertilization due to the length of male or famale parts

Materials/supplies needed
* gladiolus flower for each partner set
* scalpel
* long pins
* ruler
* Data record/analysis sheet

Procedure
1. Distribute gladiolus flowers to each partner set

2. In **Figure 1,** draw your flower. Note the color and flower position. Label the sepals and petals.

3. Using your scalpel, very carefully, make a vertical incision to open your flower.

4. Pin the petals and ovary to keep it open.

5. In **Figure 2**, draw your flower pinned open. Be sure to label: sepals, anther, stamen, filament, stigma, style, ovary, and pistil

6. Using your ruler, measure the length of the **pistal** (stigma, style, & ovary) in mm. Record information in **Table 1.**

7. Measure the length of the **filament** only (in mm). Record data in **Table 1** Repeat for all three.

8. Measure the length of the **anther** only (in mm). Record data in **Table 1** Repeat for all three. The anthers may be releasing pollen. Look for a powdery residue.

9. Look inside the ovary. See if you can find the **ovules**. When fertilized, these will become seeds.

10. Record the lengths of the pistil and filament on the class stem and leaf plot - **Figure 3**.

11. Calculate data and answer the questions.

Data Analysis Sheet

Name ______________________________ Date __________________________

Table 1 - Table of anther, filament, and pistil Lengths in mm

	#1	#2	#3	Average (mm)
Pistil		none	none	
Anther				
Filament				

Table 2 - Summary data table of pistil and stamen lengths.

	n	max	min	range	sum	mean	med
Pistil							
Stamen							

Analysis - Complete on a separate piece of paper.

1. Name the female parts of your flower.
2. Name the male parts of your flower.
3. In your flower, which was longer?
4. According to our class data table, which had the longer lengths?
5. Was your flower mature? (open or closed)
6. Was yoru flower releasing pollen? How could you tell?
7. Why would having a longer pistil or stamen be an advantage in pollination?
8. Draw the leaf of a gladiolus. Note the margin and vein pattern.

Extension

Using the data from each lab group in your class, create a line graph of length in mm (y-axis) vs. flower position (x-axis). Using 3 lines, graph the average lengths of the anthers, pistisl, and stamens. Do you notice any trends?

Conclusion - Write two or three sentences on what you learned.

adapted from www.middleschoolschience.com

Data Analysis Sheet

Name________________________________ Date ___________________________

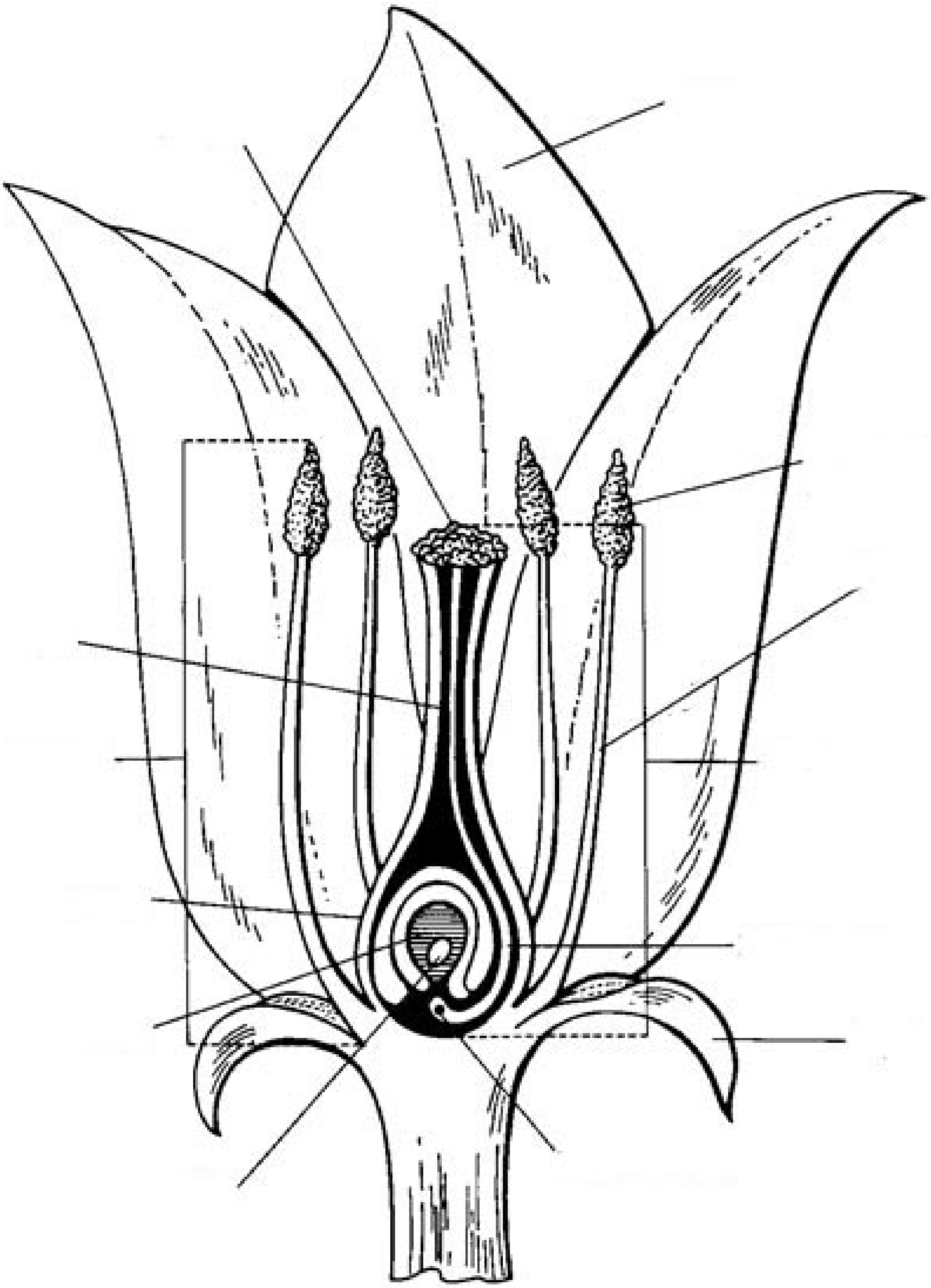
Figure 1 - Drawing of gladiolus flower

Color _____________________ Position ______________ Label sepals and petals

Figure 2 - Flower pinned open
Label: sepals, anther, stamen, filament, stigma, style, ovary, pistil

Figure 3 - Using a separate piece of paper, make a stem and leaf plot for your class data.

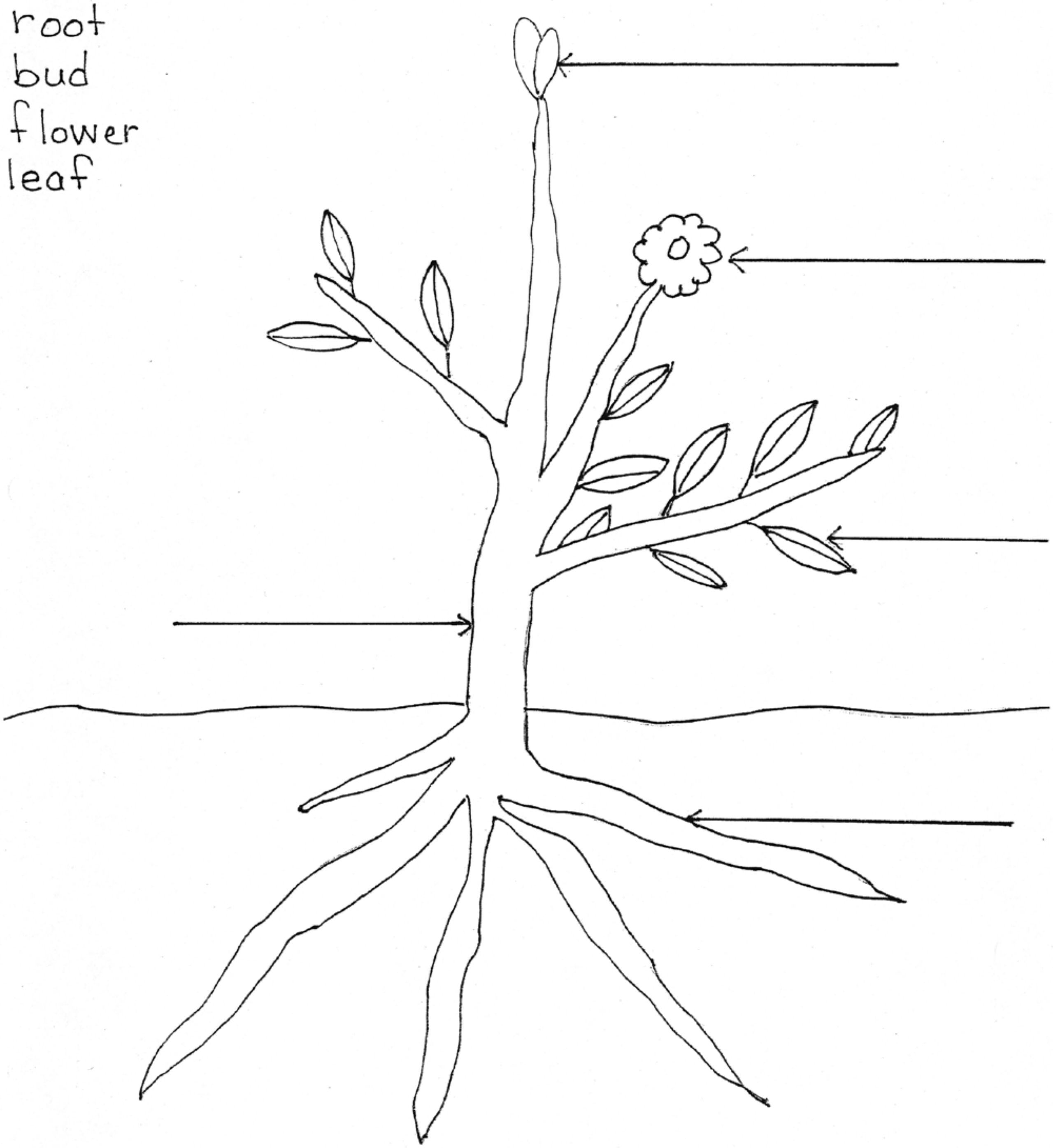
Parts of a Flower



Parts of a Plant

word bank:

stem
root
bud
flower
leaf



Sepals, sepals, cover petals,
Keep them safe, while they grow
The group is called the calyx
All around the petals
Often green, often green.

Inside the calyx are the petals
The part we love. Bees do, too.
The group is called the corolla
The crown of the flower
Often bright, often bright.

The stamen is the boy part
A long, slender stalk
Called a filament, has a sac
The sac is called the anther
It holds a lot of pollen
On the top, on the top.

The pistil is the girl part,
Centered in the flower,
A long, slender tube called the style.
Below you'll find the ovary.
It contains the ovules.
Stigma at the top,
Stigma at the top.

God, You're amazing, very creative,
Ideas galore, ideas galore
Can't wait to see the garden
You have made in heaven.
Please come soon.
Please come soon.

Student Created Flower Rubric

Content: The model contains all the parts of a complete flower (sepal, petals, anther, stamen, filament, stigma, style, ovary and pistil) and the parts are readily recognizable.	1 point: The model contains 5 or fewer components of a complete flower and/or the components are not readily recognizable.	2 points: The model contains 6 or more components of a complete flower and most are readily recognizable.	3 points: The model contains all components of a complete flower and the components are readily recognizable.
Student identification of components: The student can identify and verbally label the components of the model consistent with teacher expectations for the given student.	1 point: The student is able to identify and/or verbally label significantly fewer components than what is consistent with teacher expectations.	2 points: The student nearly meets teacher expectations for identifying and labeling the components of the model.	3 points: The student is able to fully meet or exceed teacher expectations for identifying and labeling the components of the model.
Appearance: The model is carefully constructed and is visually appealing.	1 point: The model appears to have been hastily constructed with little attention to detail.	2 points: The model is carefully constructed and has reasonable visual appeal.	3 points: The model is very carefully constructed and provides evidence of creative thought. It is highly visually appealing.
Lightskill use: The student worked cooperatively with her/his partner and actively sought opportunities to use lightskills.	1 point: The student was responsible for unnecessary conflict and/or failed to use lightskills when opportunities to do so existed.	2 points: The student worked cooperatively with her/his partner and actively took advantage of some opportunities to use lightskills.	3 points: The student worked cooperatively with her/his partner actively seeking opportunities to use lightskills to create a more peaceful environment.

Scores

Students			

Focus on a Flower

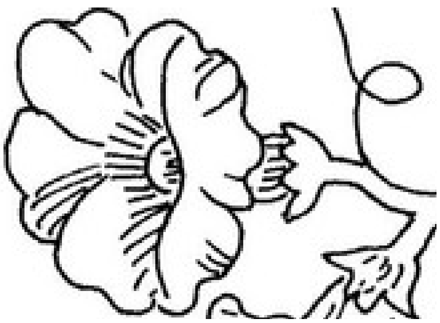
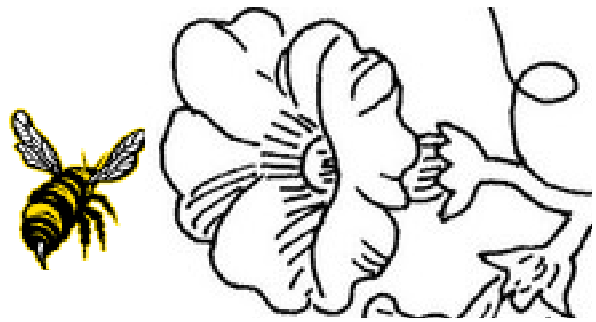
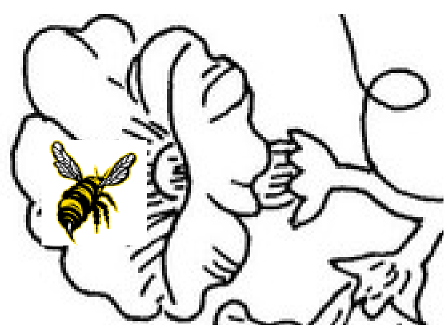
Name ______________________________ Date ____________________

Did you know that . . .

* flowers have grains called pollen?
* pollen is needed to grow seeds?
* most flowers need pollen from another flower to grow new seeds?

Directions: Study the pictures to see how one flower gets pollen from another flower. Then cut out the sentences at the bottom of the page and glue them under the correct pictures.

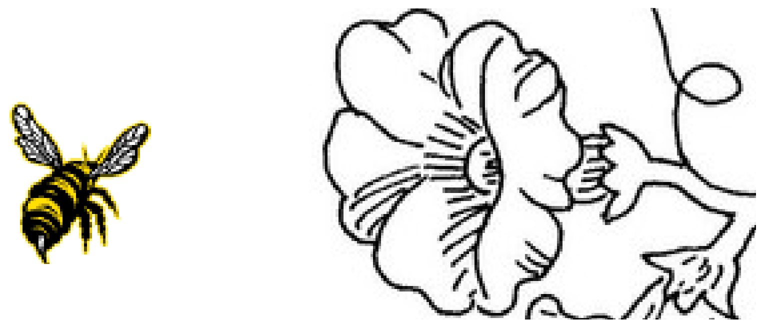
How do bees know when a flower has nector? Scent and color tell it. Color the flowers on this page for the bee.

1. 	2. 
3. 	4. 

The bee flies away. It has pollen on its back.	A flower blooms. At its center is a sweet food called nectar.
The bee stops at another flower. The pollen rubs off onto this flower.	A bee visits the flower to get nectar. Pollen rubs off on the bee.

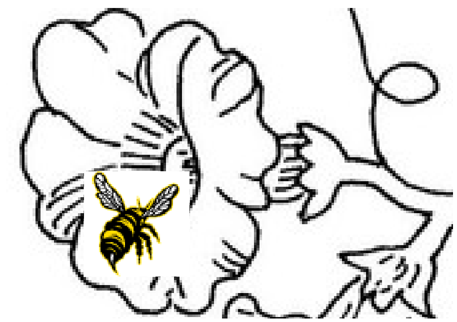
Directions:
Cut the pictures out. Glue them in order on another piece of paper. Color all of the pictures.

2.



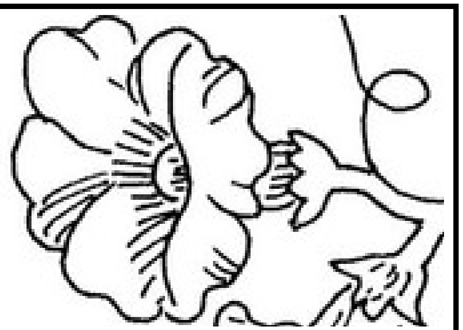
A bee comes to the flower for nectar.

4.



The pollen rubs off on the other flower.

1.



A flower blooms.

3.

The bee gets pollen on its legs.
It flies to another flower

Bee Anatomy

Name ________________________________ Date ____________________________

Plants and animals are partners in pollination.

Directions: Name the part or parts of the bee that do the following:

1. Locate the nectar.

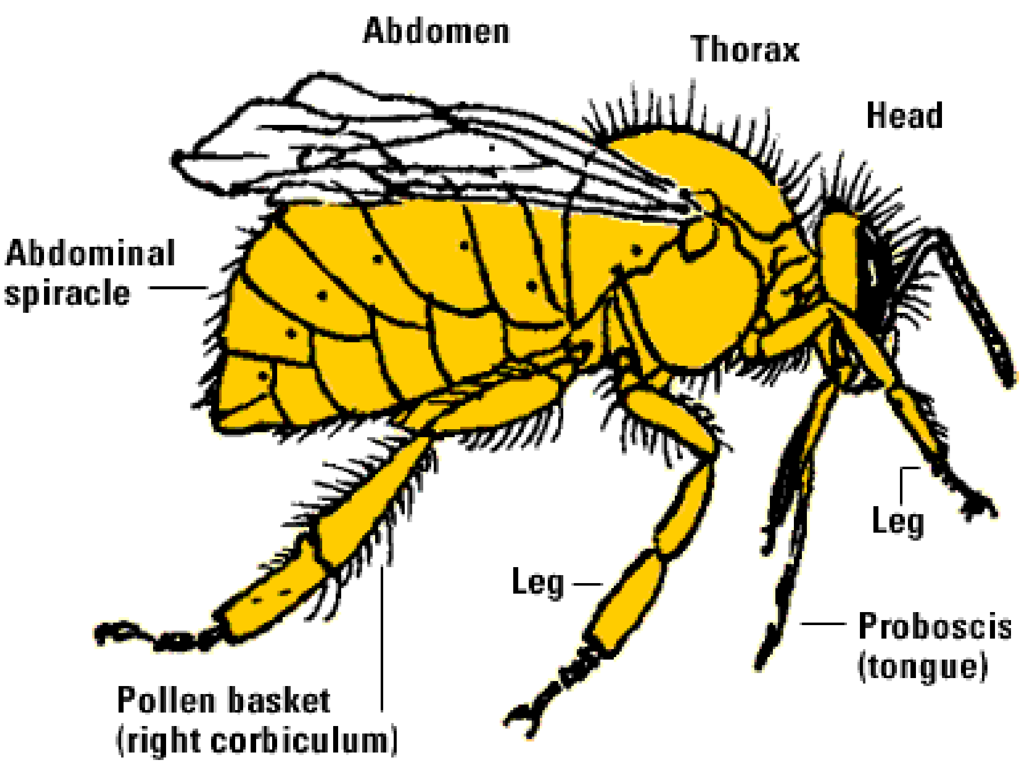
___________________________ ___________________________

___________________________ ___________________________

2. Carry pollen.

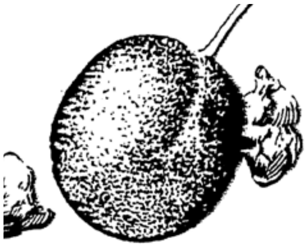
___________________________ ___________________________

___________________________ ___________________________



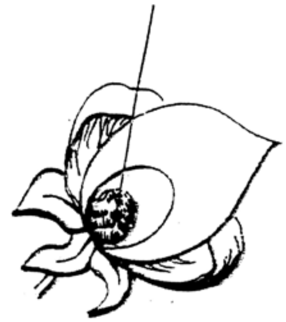
A Fruity Cycle

Directions: Cut out and arrange the pictures below in a circle to show the cycle in the development of a fruit.

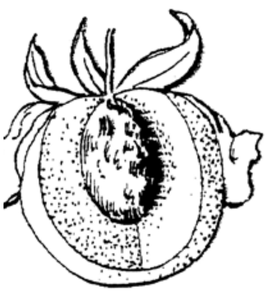


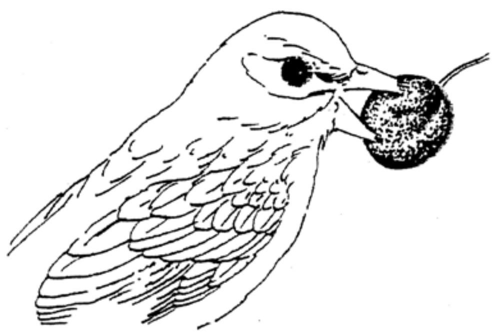
Fruit ripens, flowers fall

Embryo develops



Seed develops from embryo





Birds scatter seeds

Egg is fertilized

1. Pollen (sperm) enters the stigma

Ovary develops into fruit

adapted from:

Dear Mom, Dad or other caring adult,

I need you to help me look for seeds in the food that we are eating tonight and for the next few days. I need to collect some and take them to school so we can look for monocots and dicots. Some examples might be corn, fruit seeds, beans, squash seeds, or tomato seeds. Please help me wash them (if possible) and put them in plastic so they don't get lost.

Thank you.
Love,
Your child

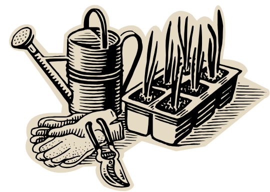
Dear Mom, Dad or other caring adult,

I need you to help me look for seeds in the food that we are eating tonight and for the next few days. I need to collect some and take them to school so we can look for monocots and dicots. Some examples might be corn, fruit seeds, beans, squash seeds, or tomato seeds. Please help me wash them (if possible) and put them in plastic so they don't get lost.

Thank you.
Love,
Your child

Group Members: ____

Germination Experiment



Question: Do seeds need air to germinate?

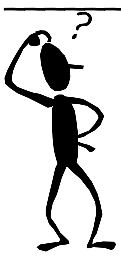
Hypothesis:____

Materials needed: two small glass jars with lids, dried peas, water

Procedure:
Step 1: Fill two glass jars with dried peas. Add a little water to both jars and put the lids on.
Step 2: Shake the jars to make sure that every pea gets wet. Take the lid off one jar but leave it on the other.
Step 3: Put the jars side-by-side in a sunny window for several days. Add a small amount of water as it evaporates from the open jar.
Step 4: Record the changes you see each day in the section of your plant journal labeled "experiments".

Conclusion:____

____



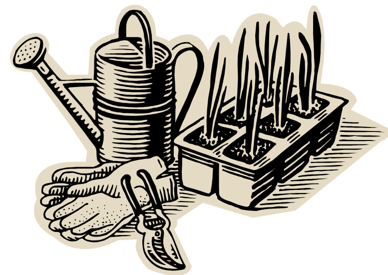
We wonder: ____

____

____

Group Members: ____

Germination Experiment



Question: Do seeds need light to germinate?

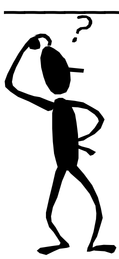
Hypothesis: ____

Materials needed: 2 paper cups, soil, dried peas or other seeds, dark paper or cardboard to cover top of one of the cups.

Procedure:
Step 1: Place equal amounts of soil in each cup. Place 3 seeds in each cup and push down into the soil an equal distance.
Step 2: Pour equal amount of water (1/4 -1/2 cup) of water into each cup.
Step 3: Cover one cup with piece of dark paper or cardboard. Place both cups in an area where each will experience the same temperature.
Step 4: Check both cups daily and add enough water to the open cup to keep the soil about as wet as that in the covered cup.
Step 5: Record the changes you see each day in the section of your plant journal labeled "experiments".

Conclusion:____

____



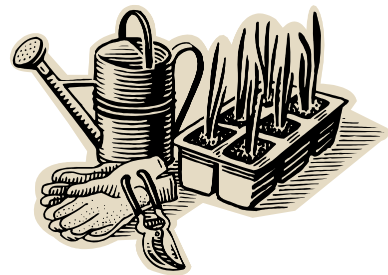
We wonder: ____

____

____

Group Members: ____

Germination Experiment



Question: Do seeds need warmth to germinate?

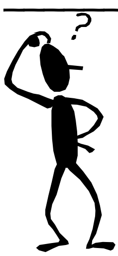
Hypothesis: ____

Materials needed: 2 paper cups, soil, dried peas or other seeds, water, refrigerator, cardboard to cover both cups

Procedure:
Step 1: Place equal amounts of soil in each cup. Place 3 seeds in each cup and push down into the soil an equal distance.
Step 2: Pour 1/4 cup of water of water into each cup.
Step 3: Cover both cups with piece of dark paper or cardboard.
Step 4: Place one cup in a refrigerator and the other in a warm area such as a window sill or heater vent.
Step 5: Record the changes you see each day in the section of your plant journal labeled "experiments".

Conclusion:____

____



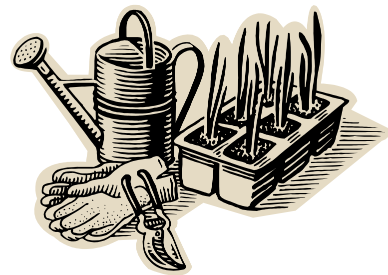
We wonder: ____

____

____

Group Members: ____

Germination Experiment



Question: Do seeds need water to germinate?

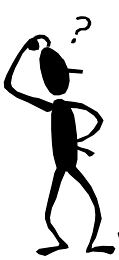
Hypothesis: ____

Materials needed: 2 paper cups, soil, dried peas or other seeds, water

Procedure:
Step 1: Place equal amounts of soil in each cup. Place 3 seeds in each cup and push down into the soil an equal distance.
Step 2: Pour 1/4 cup of water of water into one cup but leave the soil in the other cup dry.
Step 3: Place both cups where they will experience identical conditions.
Step 4: Keep the soil in the first cup moist by adding water daily if needed.
Step 5: Record the changes you see each day in the section of your plant journal labeled "experiments".

Conclusion:____

____



We wonder: ____

____

____

Germination Experiment Rubric

The student made a reasonable hypothesis regarding the outcome of the experiment.	1 point: The student made an illogical hypothesis.	2 points: The student made a reasonable hypothesis but could not provide a logical rationale for it.	3 points: The student made a reasonable hypothesis and provided a logical rationale for it.
The students read and carefully followed the directions for setting up the experiment.	1 point: The students either did not read or did not follow the directions resulting in an invalid experiment.	2 points: The students read the directions and followed most of them accurately but did not attend to details.	3 points: The students carefully read and followed the directions with attention to details.
The student observed and carefully recorded observations throughout the duration of the experiment.	1 point: The student did not make careful observations and/or did not record them carefully. Written observations include many unexpected errors in mechanics.	2 points: The student made some careful observations and recorded most of them. Written observations include some unexpected errors in mechanics.	3 points: The student observed and recorded observations with careful attention to detail including writing mechanics.
The students drew a reasonable conclusion from the results of the experiment and formulated an additional logical question.	The students drew an incomplete or illogical conclusion based on the results of the experiment and/or formulated an illogical question.	The students drew a reasonable conclusion from the results of the experiment and formulated a logical question.	The students drew an insightful conclusion from the results of the experiment and formulated more than one logical question.
The students worked together cooperatively, using lightskills whenever the opportunity to do so existed.	The student was responsible for unnecessary conflict and/or failed to use lightskills when opportunities to do so existed.	The student worked cooperatively with her/his partner and actively took advantage of opportunities to use lightskills.	The student worked cooperatively with her/his group, seeking opportunities to use lightskills to create a more peaceful environment.

Scores

Students			

Name ___________________________

Steps in Reproduction of Flowering Plants

Number the following steps in sequence to explain the order of pollination, fertilization and germination. The first step has been identified for you.

_____ Photosynthesis begins and leaves develop.

_____ The ovule develops into a seed with an embryo inside.

_____ The pollen tube reaches the ovary where the ovules are located.

_____ When the seed is fully developed, it stops growing, but the fruit continues to develop until it is picked or drops.

_____ As the seed develops, the ovary enlarges and becomes a fruit containing one or more seeds.

__1__ A grain of pollen lands on the stigma of the pistil.

_____ As water enters the seed, it swells, splitting the seed coat. Part of the embryo grows down to become roots and part grows up to become the stem.

_____ The seed wall toughens and the seed begins to store starch in the cotyledons.

_____ Sperm cells are released from the pollen tube and one fuses with the egg resulting in fertilization.

_____ The seed remains inactive until there is the right amount of warmth, light, oxygen, and moisture for growth.

_____ The pollen grain sends a narrow tube down style to the ovary.

_____ The plant embryo germinates and begins to develop into a young plant.

Name(s) ___________________

Propagation Experiment: Grafting

Materials needed: knife; rubbing alcohol; two small column-like cactus plants of approximately the same diameter; yarn; newspaper; cotton balls

Step 1: Get the two cactus plants and place a length of string under the plant pots (it should be long enough so that the ends can be tied together at the top).
Step 2: Dip a sharp knife into rubbing alcohol to kill germs on it. Fold a newspaper into a thick pad and use it to protect your hand while handling the cacti. Use the knife to slice off the top of each cactus plant. Do not touch the cut surfaces of the plants. Using cotton balls to protect your fingers, place each top on the other plant base. Bring the yarn up and tie it above the newly formed plant to hold it in place. Put the pots in a sunny window. After a month, the grafts should heal so that you can remove the yarn.
Step 3: Record your observation once a week in the boxes below.

At the end of one week:	At the end of two weeks:
At the end of three weeks:	At the end of four weeks:

Name(s) _______________________

Propagation Experiment: Growing from a Stem

Materials needed: geranium, coleus, ivy or pussy willow stems; a jar of sand for each plant to be grown; water; potting soil

Step 1: Cut off a stem 3 to 4 inches long from any of the plants listed above. Remove the leaves from the lower part of the stem.
Step 2: Plant the stem cutting near the edge of the jar of wet sand so that you can see the stem. Keep the cuttings moist.
Step 3: Watch for the growth of roots. When the roots are growing well, plant the cutting in a container of potting soil.
Step 4: Observe once a week and record your observations in the boxes below.

At the end of one week:	At the end of two weeks:
At the end of three weeks:	At the end of four weeks:

Name(s) ______________________

Propagation Experiment: Growing from Bulbs

Materials needed: onion; toothpicks; jar; water

Step 1: Stick 4 toothpicks into each bulb about 1/2 inch into the onion to support it.

Step 2: Set the bulb in the mouth of the jar so that only the lower part of the bulb is in water.

Step 3: Observe once a week for 4 weeks. Record your observations in the boxes below.

At the end of one week:	At the end of two weeks:
At the end of three weeks:	At the end of four weeks:

Did you know that the bulb of an onion is really a stem with many thick leaves wrapped around it? The leaves contain stored food.

Name(s) ______________________

Propagation Experiment: Growing from a Tuber

Materials needed: white potato; knife; several glass jars; washed sand

Step 1: Find the eyes or buds on the potato. Cut the potato into several pieces making sure that each piece has one or more eyes.

Step 2: Plant each piece with the eye up in a glass jar of sand. Place the piece near the edge of the jar so you can observe the plant as it grows. Keep the sand moist at all times.

Step 3: Observe once a week for four weeks. Record your observations in the boxes below.

At the end of the first week:	At the end of the second week:
At the end of the third week:	At the end of the fourth week:

Did you know that some plants, like potatoes, have large underground stems called tubers that contain stored food? These can be used to grow new plants.

Name(s)_________________________

Propagation Experiment: Hormones and Root Growth

Materials needed: 2 milk cartons or paper cups; sand or vermiculite; geranium or coleus plant; water; scissors; root hormone

Step 1: Punch one or two drainage holes in the bottom of the two containers. Fill the containers with sand and wet it.

Step 2: Cut two stems, 4 to 6 inches long, off a geranium or coleus plant. Dip the cut end of one stem into hormone powder. Plant the stem in one of the cartons. Label the carton "root hormone". Plant the second stem in the other carton. Label the second carton "no hormone". Date both cartons.

Step 3: Carefully remove both stem cuttings from the sand each day, comparing to see which develops roots first, being careful not to mix them up. Return the stems to the container. How long does it take each cutting to develop roots? Record your observations in the boxes below.

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
Without root hormone										
With root hormone										

Names ___________________________

Propagation Experiments: Growing from Roots

Materials needed: sweet potato; toothpicks; jar of water;

Step 1: With the sweet potato standing on end, stick four toothpicks into its sides to support it.

Step 2: Set the potato on the rim of a jar of water so that the narrow pointed end of the potato is in the water. Set the jar in a warm, dark place until the stem begins to grow. Then move the plant into the light.

Step 3: Observe the potato and, every 3 to 4 days, record your observations in the boxes below. Include the date of each observation.

First observation	Second observation	Third observation
Fourth observation	Fifth observation	Sixth observation

Think about it: most plants need to be in soil to grow but when the sweet potato was growing in the soil it produced enough food through photosynthesis and stored it in the potato. This stored food provides enough energy to grow a new plant.

Names ____________________________

Propagation Experiment: Growing from Roots

Materials needed: carrot, beet and/or turnip; shallow dish;

Step 1: Cut one or two inches off the top of the root. Remove any wilted leaves

Step 2: Set the root in a shallow dish of wet vermiculite or gravel.

Step 3: Observe the root and, every 3 to 4 days, record your observations in the boxes below. Include the date of each observation.

First observation	Second observation	Third observation
Fourth observation	Fifth observation	Sixth observation

Name ____________________

Sweet Potato

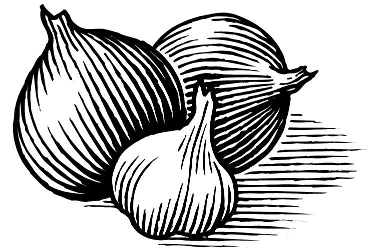
1	2
3	4
5	6

Name ______________________

African Violet

1	2
3	4
5	6

Name ________________________



Onion

1	2
3	4
5	6

Vegetative Propagation Experiment Rubric

The students read and carefully followed the directions for setting up the experiment.	1 point: The students either did not read or did not follow the directions resulting in an invalid experiment.	2 points: The students read the directions and followed most of them accurately but did not attend to details.	3 points: The students carefully read and followed the directions with attention to details.
The student observed and carefully recorded observations throughout the duration of the experiment.	1 point: The student did not make careful observations and/or did not record them carefully. Written observations include many unexpected errors in mechanics.	2 points: The student made some careful observations and recorded most of them. Written observations include some unexpected errors in mechanics.	3 points: The student observed and recorded observations with careful attention to detail including writing mechanics.
The students drew a reasonable conclusion from the results of the experiment.	The students drew an incomplete or illogical conclusion based on the results of the experiment.	The students drew a reasonable conclusion from the results of the experiment.	The students drew an insightful conclusion from the results of the experiment.
The students worked together cooperatively, using lightskills whenever the opportunity to do so existed.	The student was responsible for unnecessary conflict and/or failed to use lightskills when opportunities to do so existed.	The student worked cooperatively with her/his partner and actively took advantage of opportunities to use lightskills.	The student worked cooperatively with her/his group, seeking opportunities to use lightskills to create a more peaceful environment.

Scores

Students			

Name ______________________________ **Date** __________________________

1. Number each of the following in the order that they occur during photosynthesis.

_____ Light energy changes carbon dioxide and water into glucose and oxygen.

_____ Oxygen atoms exit the plant through stomata found in the leaf.

_____ Chlorophyll in the plant captures light energy.

_____ Energy supplied by ATP is used to combine carbon dioxide with hydrogen.

2. Define the following terms:

A. ATP -

B. Dark reaction -

C. Light reaction -

D. Sporangia -

E. Transpiration -

3. What does a plant use for energy to live?

4. What happens to the excess water in a plant?

5. Describe alternation of generation.

6. How can a cactus survive when there may be years between rainfalls?

Name KEY **Date** ____________________

1. Number each of the following in the order that they occur during photosynthesis.

   __2__ Light energy changes carbon dioxide and water into glucose and oxygen.

   __3__ Oxygen atoms exit the plant through stomata found in the leaf.

   __1__ Chlorophyll in the plant captures light energy.

   __4__ Energy supplied by ATP is used to combine carbon dioxide with hydrogen.

2. Define the following terms:

   A. ATP - ***an energy-rich compound formed during photosyntheses (adenosine triphosphate)***

   B. Dark reaction - ***the stage of photosynthesis during which ATP is used to comnbine carbon dioxide with hydrogen.***

   C. Light reaction - ***the stage of photosynthesis during which light energy is trapped and used to split water.***

   D. Sporangia - ***the structure that holds and distributes spores.***

   E. Transpiration - ***the movement and release of water through leaves***

3. What does a plant use for energy to live? ***Glucose, which is broken down during cdll respiration***

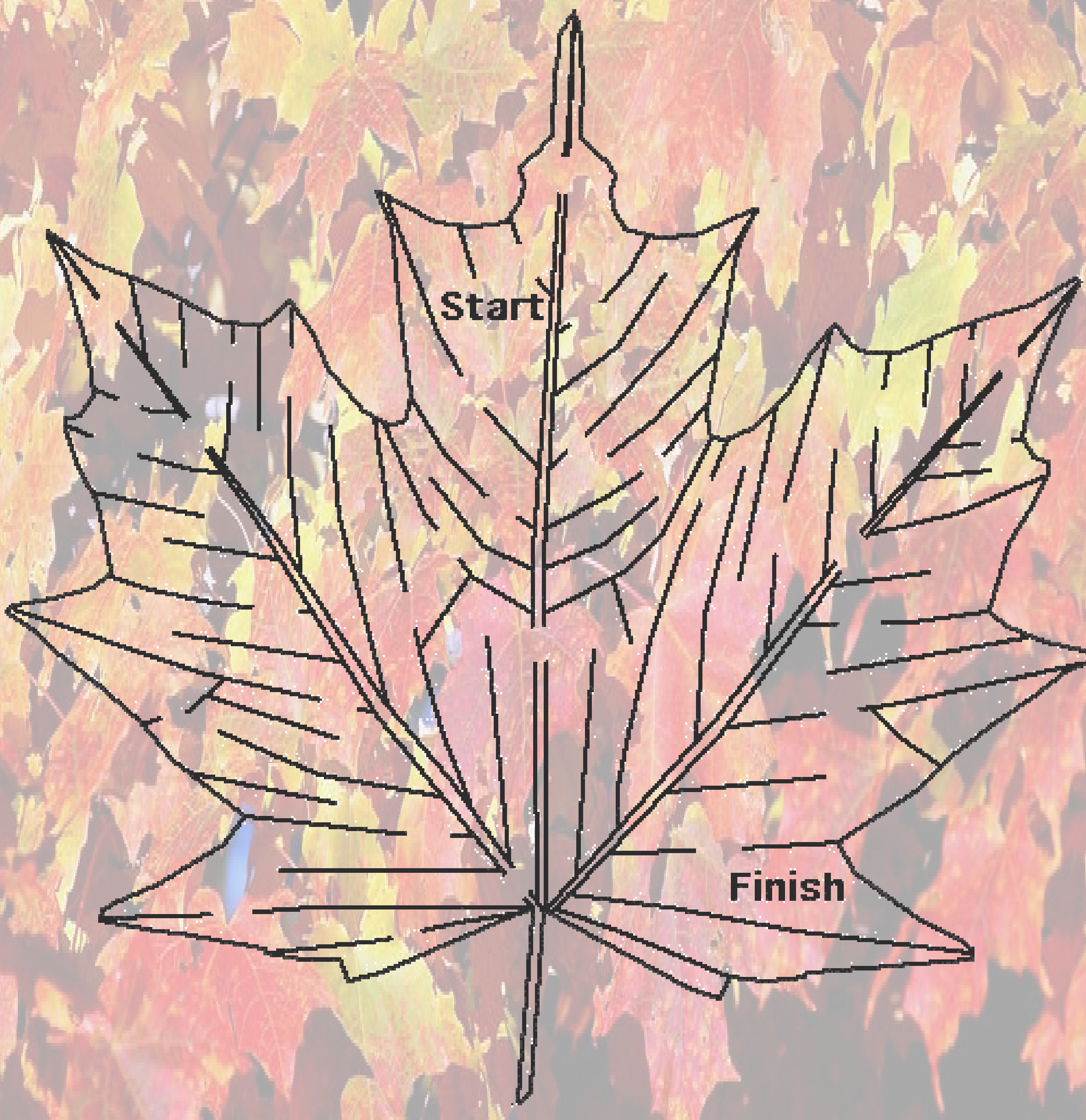
4. What happens to the excess water in a plant? ***It travels to the leaves and is released through transpiration.***

5. Describe alternation of generation. ***Alternation of generation is two-stage plant reporduction.The first stage involves the production of gametes by the game-tophyte plant, which grows into the sporophyte plant that produces spores. Then the spores grow into another gametophyte plant.***

6. How can a cactus survive when there may be years between rainfalls? ***Because cactus is a vascular plant, it can quickly absorb large amounts of water during a storm and store the water for years of dry weather.***

Amazing Leaves

Name ________________________________ Date ________________



Name(s) ______________________________

Tropism Experiments: Phototropism

Materials needed: milk carton; paper bag; potting soil; 3 bean seeds; water; scissors

Step 1: Plant the bean seeds in the milk carton. Keep the soil moist at all times.
Step 2: When the beans are 3 to 4 inches high, cut a two-inch hole in the side of the paper bag near the top. Cover the plants with the bag. Place the side of the bag with the hole toward the light.
Step3: After several days uncover the plant. Record your observations in the boxes below, either by drawing pictures or writing descriptions.

Step 1: Beans seeds planted	Step 2: Bean plants without bag covering them
Step 3: Bean plants covered	Step 4: Bean plants after3 to 4 days with bag removed.

Names ____________________

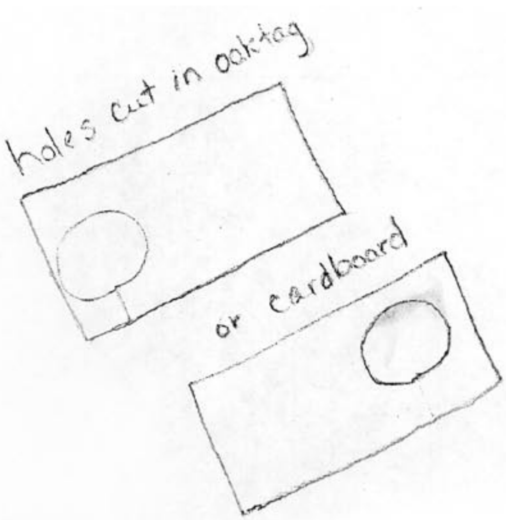
Tropism Experiment: Phototropism

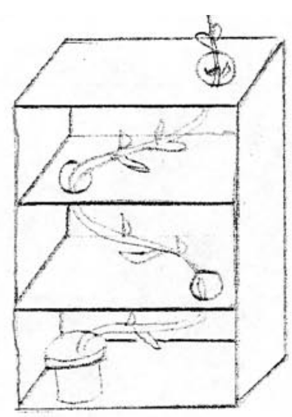
Materials needed: shoebox with lid; oaktag or cardboard, 2 pieces cut to divide the width of the inside of the box; a bean or bean plant; flowerpot with saucer small enough to fit inside shoebox; potting soil (if planting bean); water; rubber band

Step 1: Cut circles in each of the cardboard strips as shown below. Stand the shoebox on end and insert and tape the cardboard strips so that they are spaced evenly and so that the holes do not line up with each other. Allow room for the pot to sit on the "floor" of the up-ended box.

Step 2: Cut a hole in the end (the top of the box when standing on its end) of the box so that it does not line up with the hole in the "shelf" below it.

Step 3: Plant the bean and place it or the bean plant on the floor of the up-ended box on the side opposite the hole of the bottom "shelf". Cover the box with the lid and secure it with the rubber band. Place it in a brightly lit place. Open the box only to water the plant. When watering the plant, observe and record on the next page what you see in the boxes.





Phototropism Experiment Observation Form

1	2
3	4
5	6

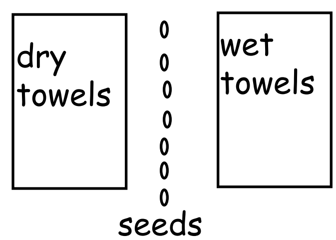
Name(s) ______________________

Tropism Experiment: Hydrotropism

Materials needed: 2 pieces of glass (5" to 6" square); paper towels; water; radish or mustard seeds; masking tape

Step 1: Cut several layers of paper towel just smaller than the glass squares. Then cut the toweling in half. Soak one half of the toweling in water, while keeping the other half dry.

Step 2: Place a row of radish seeds down the center of on of the pieces of glass. Place the wet toweling to one side of the seeds and the dry toweling to the other side as shown.



Step 3: Put the second glass square on top of the toweling and seed arrangement to make a sandwich. Seal the edges of the sandwich with masking tape. Put the sandwich in a dark closet.

Step 4: Observe 2 to 3 days later and record your observations in the boxes below.

First day	2 to 3 days later

What do you conclude:

____

____

____

____

____

Name(s)_________________________

Tropism Experiment: Geotropism

Materials needed: 2 pieces of glass (5" to 6" square); paper towel; tape; saucer; radish seeds

Step 1: Place several radish seeds on several layers of wet paper towel that have been folded to fit a glass square. Place the second glass square on top of the seeds like a sandwich. Tape the squares together.
Step 2: Stand the glass sandwich upright in a shallow dish of water. Keep the dish full of water so that the paper towel is always wet. When the seeds sprout, note the direction in which the roots grow.
Step 3: When the roots are about an inch long, turn the glass so that the roots are pointing up. Leave the glass this way and observe again in several days. Repeat if you wish. Illustrate your observations in the boxes below and date them.

First day:	First observation: (before turning)
After turning:	Second observation:

Name(s)______________________

Tropism Experiment: Phototropism

Materials Needed: 3 small, mature potted plants; sunny location; drinking glass; water;

Step 1: Place all three potted plants in a sunny location but tip one on its side toward the sun and another on its side away from the sun. Leave the third upright.

Step 2: Water each plant as usual (you may turn them right-side-up to water them). Record and date your observations every 4 to 5 days in the boxes below.

Observation 1	Observation 2	Observation 3
Observation 4	Observation 5	Observation 6

Tropism Experiment Rubric

The students read and carefully followed the directions for setting up the experiment.	1 point: The students either did not read or did not follow the directions resulting in an invalid experiment.	2 points: The students read the directions and followed most of them accurately but did not attend to details.	3 points: The students carefully read and followed the directions with attention to details.
The student observed and carefully recorded observations throughout the duration of the experiment.	1 point: The student did not make careful observations and/or did not record them carefully. Written observations include many unexpected errors in mechanics.	2 points: The student made some careful observations and recorded most of them. Written observations include some unexpected errors in mechanics.	3 points: The student observed and recorded observations with careful attention to detail including writing mechanics.
The students drew a reasonable conclusion from the results of the experiment.	The students drew an incomplete or illogical conclusion based on the results of the experiment.	The students drew a reasonable conclusion from the results of the experiment.	The students drew an insightful conclusion from the results of the experiment.
The students worked together cooperatively, using lightskills whenever the opportunity to do so existed.	The student was responsible for unnecessary conflict and/or failed to use lightskills when opportunities to do so existed.	The student worked cooperatively with her/his partner and actively took advantage of opportunities to use lightskills.	The student worked cooperatively with her/his group, seeking opportunities to use lightskills to create a more peaceful environment.

Scores

Students			

Rubric for Collage of Products Made from Plants

Content: The products included in the collage are those which have been made from plants or parts of plants.	1 point: less than 75% of the products pictured are made from plants or plant parts and/or there is little variety in the products depicted.	2 points: Nearly all of the products pictured are made of plants or plant parts and include a variety of products.	3 points: All the products pictured are made of plants or plant parts and include a great variety of products.
Appearance: The collage is neatly done, with little or no background paper showing. The pictures are neatly cut and are arranged in a visually appealing manner.	1 point: The collage appears to have been constructed hastily and/or considerable background paper is showing and/or the cutting and arrangement of pictures does not meet teacher expectations.	2 points: Most of the background paper is covered. Pictures are cut and arranged with reasonable care. The collage is visually appealing and nearly meets teacher expectations.	3 points: All or very nearly all of the background paper is covered. The pictures have been cut and arranged in a manner than fully meets or exceeds teacher expectations.
Lightskill Use: The students worked together cooperatively with her/his group and actively sought opportunities to use lightskills.	1 point: The student was responsible for unnecessary conflict and/or failed to use lightskills when opportunities to do so existed.	2 points: The student worked cooperatively with her/his group and actively took advantage of opportunities to use lightskills.	3 points: The student worked cooperatively with her/his partner, actively seeking opportunities to create a more peaceful environment.

Scores

Students			

Know which plants around your house are poisonous.

Never eat plants, seeds or berries unless they are commonly used for food.

Never eat the roots or bulbs of unknown plants, especially if they look like onions.

Never eat wild mushrooms.

Never eat or touch plants
with colored or milky juice.

Never leave dangerous plants
where little children or pets
can reach them.

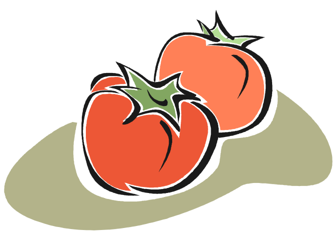
holly

philodendron

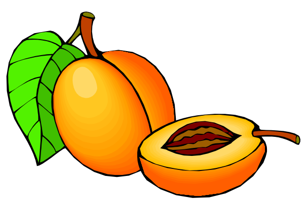
daffodil

hyacinth

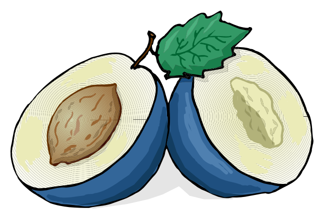
potato sprouts and green parts



tomato leaves and vines



apricot seeds



plum seeds

Morning Devotionals

Unless otherwise indicated, the following devotional readings are taken from the book *Talking Trees and Singing Whales* written by Charles Case. The author has graciously granted permission for their inclusion in this resource.

Tall and Majestic

The cedars of Lebanon, that are high and lifted up. Isaiah 2:13

In the time of Christ, the largest trees growing in the Middle East were the cedars of Lebanon. There are many Bible verses referring to these large trees. However, neither Christ nor the people at that time had seen the large redwoods that are found in the United States. Two species are found on the coast of California and in the national parks of Yosemite and Sequoia, also in California. There is one other species found in China, but it is not an evergreen and not as large a tree.

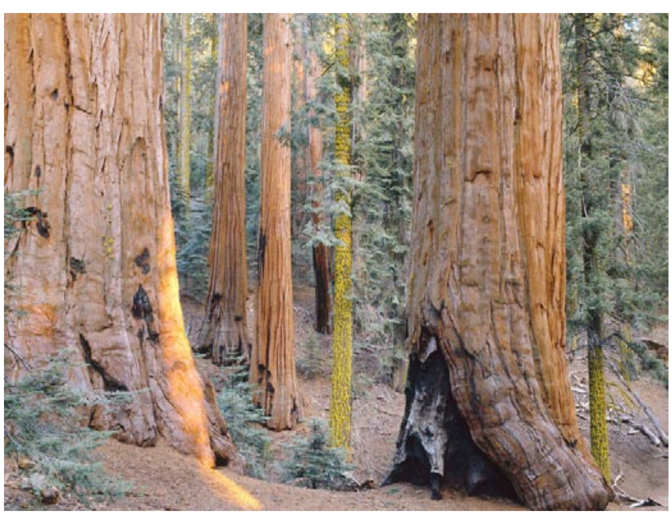
The redwoods along the California coast are the tallest trees—the tallest being 368.6 feet high. The sequoias are not as tall but are much bigger around. The largest tree known today is the General Sherman Tree in Sequoia National Park in California. This tree measures 274.9 feet high and 102.6 feet in circumference. It is estimated that the tree would yield more than 600,000 board feet of lumber. Naturalists estimate this tree to be about 3,500 years old, which would mean that it would have started growing some 1,500 years before Christ.

Redwoods have an extensive root system. Because of this and the great strength in their trunks, strong winds can scarcely uproot them.

In Psalm 1:3, faithful and loyal people are likened to trees. But, He wants us to beware lest we fall. God wants us to hold our heads up because we are Christians, but not to be proud of what we have accomplished. As Jesus said, "Without me ye can do nothing." (John 15:5)

Tell God in prayer this morning that you want His help to hold your head high as a Christian, and to represent Him today to your friends.

http://www.nps.gov/seki/lpvc.htm



Petrified

Yea, they made their hearts as an adamant stone, lest they should hear the law, and the words which the Lord of hosts hath sent his spirit by the former prophets. Zechariah 7:12

What does it mean to be petrified? It means to be turned to stone. The children of Israel turned their hearts into stone because they didn't want to do what God wanted them to do. Figuratively they became petrified, although the petrifaction that we talk about this morning is a real physical change.

Trees are known to have become rock through the process of petrifaction. These can be seen in the Petrified Forest in the Arizona desert. It is interesting to see the trees now turned to rock.

Scientists say that in order for petrifaction to happen several things much occur. It begins when water that is bearing some minerals circulates through buried fresh wood and combines with oxygen so that no microorganisms such as fungi or bacteria, capable of digesting and rotting the organic material, can get into the wood pores. The moving water carries dissolved calcium carbonate or silica that infiltrates and surrounds the woody tissues. As the water moves out it leaves the minute particles of calcium carbonate or silica that infiltrate any cavities in the wood cells and replaces them. That is the process of petrifaction.

Some scientists talk about the billions of years that it took to do this, but we understand and believe that this is largely a result of the Flood. As you look at petrified wood, you see different colors. Iron oxides produced the fiery reds, yellows, and browns. Researchers tell us that there are more than 40 minerals that are petrifying agents, but only four are common.

As the children of Israel hardened their hearts to God's word, so we, through sin, harden our hearts to the Savior. He wants to come in, but if we allow sin to penetrate our lives our hearts will petrify and Jesus cannot get in. Pray this morning, asking God to send Jesus into your life so your heart will not become hardened and petrified by sin.

Flexibility and Pride

This morning I was awakened by the sound of wind going through the leaves outside. There was a thunderstorm coming, and it was violently blowing the trees. As I watched, I began to worry. The trees by my house are tall and strong. They do not like to bend, but as the wind struck them I began to feel that this might be a bad thing. If they could not bend, they might snap and fall on the house.

Further away from my house were some different trees. They were not as big. They were not as strong. But I could see, as they bent in the wind, that there was no danger of these trees falling or snapping. They did not seem as tall and proud as the trees next to my house, but they were safer.

I began to wish I could switch the trees around. It occurred to me that there is a time for greatness and strength but there is also a time and place for flexibility. Flexibility does not mean that I compromise what I know is true and right. However, some situations require me to give up ideas or plans that I may have held for a long time. Flexibility means that I am mature enough to look at the ideas of others and give them fair consideration, agreeing to use them when I realize that they are better than my own ideas. It may mean that I am able to look for various options and then with the guidance of the Holy Spirit choose a path different than the one I started out on. Flexibility is not always an easy light-skill to exercise, but it is one which may keep me or someone else from snapping and falling to defeat.

Contributed by Jeremy Garlock

Roots

When I was a camp counselor, one of my favorite all-camp games was Capture the Flag. The entire camp was split into two teams, each one on its own side. Each team had to try to sneak over to the other team's side, catch their flag, and get back over to their own side without getting caught. Dividing the two sides was a gully we called "No Man's Land." If you were in that gully you were safe and could not get caught.

One time I had successfully snuck over to the other side, but while searching for their flag I was discovered. I quickly began to run as fast as I could back to my side. Some counselors from the other team were in hot pursuit and were catching up to me.

As I approached the gully I realized I was in big trouble. This particular part of the gully was huge. There was no way I could jump to the other side, and it was too deep to jump into safely. The lack of rain that year meant that there was no water running through the gully. Its bottom lay exposed, showing the uneven ground and debris. If I jumped I would most likely twist an ankle, or worse.

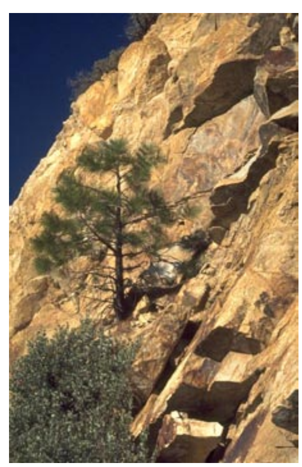
On the other hand, if I slowed down enough to safely climb down, my opponents would most surely catch me. Without time to think I did the only thing I could. I ran right over the side of the gully.

Lucky for me there was a little tree growing out of the side of the gully. As I fell, I grabbed onto this tree and hung there. I was now inside the gully and could not be caught. Slowly I let myself down off the tree and into the gully.

I sat, looking at the tree. How could it have held me? It was no bigger around than my wrist, and it grew out of rocks. I thought that my weight should have pulled it out. Then I noticed its roots. There were many of them, and they were going deep into the earth beneath the rocks. The roots supported the tiny tree so it could hold my weight.

We are also like plants in this world. Trouble often comes from Satan who should be able to knock us down. But, when we have our roots deeply buried in God then we can continue to stand. Not only do these roots bring us nourishment from God, but they also anchor us to Him so that we can stand through the hard times.

Contributed by Jeremy Garlock



Plant Beauty

Plants are beautiful. You can take a stroll through my back yard and see all kinds of colors. There are browns, different shades of greens, yellows, oranges, blues, purples, and reds. Some plants are tall and majestic. Others are short and weak. Many are bushy, and just as many are lean. Leaves come in many shapes and sizes. You can see veins in some, but not in others. Some are thin like needles, while others are broad like big hands.

How beautiful these plants are. They have a variety like that of humans. But unlike humans, they don't try to make themselves beautiful. They just grow in the majesty that God gave them. What beauty has God given you? Have you cultivated habits of integrity? How about caring and encouragement for others? Has God given you a keen sense of humor? Do you use it to bring laughter to others, being careful not to cause pain? An old adage says, "Pretty is as pretty does" while another one says "Beauty is only skin deep." What do these two sayings mean to you? If you are pretty on the outside does your inner beauty match? If you are not so physically attractive, take heart—neither was Jesus. The Bible tells us that there was nothing about His physical appearance that drew people to Him. Rather it was the way He loved and cared for those around Him that made Him irresistible. Likewise, a Spirit-filled character will cause others to think of you as beautiful regardless of your shape or size or facial features.

"See how the lilies of the field grow. They do not labor or spin. Yet I tell you not even Solomon in all his splendor was not dressed as one of these." Matthew 6:28, 29

Contributed by Jeremy Garlock

Peat Heat

If then God so clothe the grass, which is today in the field, and tomorrow is cast into the oven; how much more will he clothe you, O ye of little faith? Luke 12:28

Some years ago our family was traveling along the country roads of Ireland. We saw interesting fields that had been cut like steps. Other fields had straight up-and-down cuts like a knife cut. That night as we stopped at a tourist house we found that they were burning a sweet-smelling, bricklike substance called "peat" in their fireplace.

We found out that peat is formed when plants such as mosses and sedges are partially decomposed in water. For about $7.00 a year, the Irish lease from the government the space they need in a bog. They go there and cut out the peat bricks to burn. The peat bricks are cut with an L-shaped tool called a slave, which is sharp on the bottom. This part is pushed down into the bog like a shovel or spade. As it is pushed down, it cuts.

The peat bricks, which weigh about 15 pounds each, are taken to the owner's house and put out to dry. A dry brick weighs from four to five pounds. When dry, a process that takes about two months, the bricks are stacked against the house on the end that has no gable. The peat acts like insulation, helping to keep the heat in. A family may cut several thousand peat bricks in a week. Many households will use up to 15 tons of dried peat a winter, so 50 or 60 tons of wet peat must be cut.

Peat bricks are used for heating and cooking. Food that is cooked with peat bricks has a special sweet odor, similar to the way frying potatoes over a hickory fire picks up a special flavor. Water is also heated for bathing and washing clothes by burning peat bricks.

God takes care of all our needs if we will just trust Him. For years. H.M.S. Richards used to end his radio broadcasts of the Voice of Prophecy with "the longest unfinished poem," "Have faith, dear friend, in God." We must have faith in God. Tell Him in your prayer about how much faith you have in Him as your God.

Liverworts

Behold there is a people come out from Egypt: behold, they cover the face of the earth, and they abide over against me. Numbers 22:5

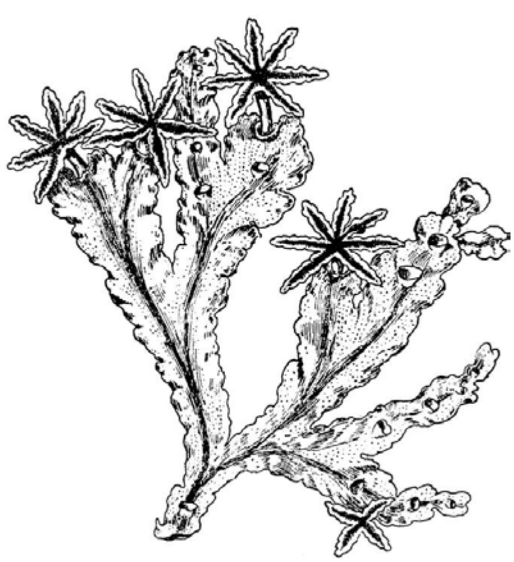
There are plants that cover many areas of this earth that we call mosses, but actually they are liverworts. They are closely related to the mosses. The liverwort gets its name because in the early days, people thought that since the small leaves looked like the human liver, the plants must be good as a cure for liver diseases.

The liverworts usually grow in cool, shady areas or near water. There are some varieties that actually grow in water. Liverworts are valuable to mankind, especially where there is bare soil, because they will take root and prevent soil erosion.

The main part of the plant is called the <u>thallus</u>. Underneath this leaflike part there are little rootlike projections that absorb water and minerals, which the liverwort needs to stay alive. These rootlets also hold the plant to the rocks and trees.

On the liverwort thallus, or gametophyte, there are male and female organs that help in one method of reproduction of the plant. The male cells are called antherozoids and the female cells are called eggs. The antherozoids swim through the moisture on the surface of the plant over to the eggs; as they meet, the egg is fertilized. The fertilized egg then grows into a tiny new structure called the sporophyte. This sporophyte lives on the thallus and in time begins to produce spores, which are the tiny seedlike bodies that make new plants. Thus, they alternate. The gametophyte produces gametophytes. As these tiny spores grow, more and more earth is covered.

As the liverworts cover the ground, so the children of Israel were covering the land of Moab, and King Balak was fearful. A day will come when the world will be fearful of God's remnant church and they will do what they can to destroy it. At that time, as always, you and I must be ready and faithful to stand up for our beliefs. Ask God to help you be ready every day until Jesus comes.



Driftwood

But let him ask in faith, nothing wavering. For he that wavereth is like a wave of the sea driven with the wind and tossed. James 1:6

In the forests around the world there are many trees. Most of these, when they die, will lie on the forest floor and rot. Others are cut up by man and used for firewood, or made into houses or objects that are useful or decorative.

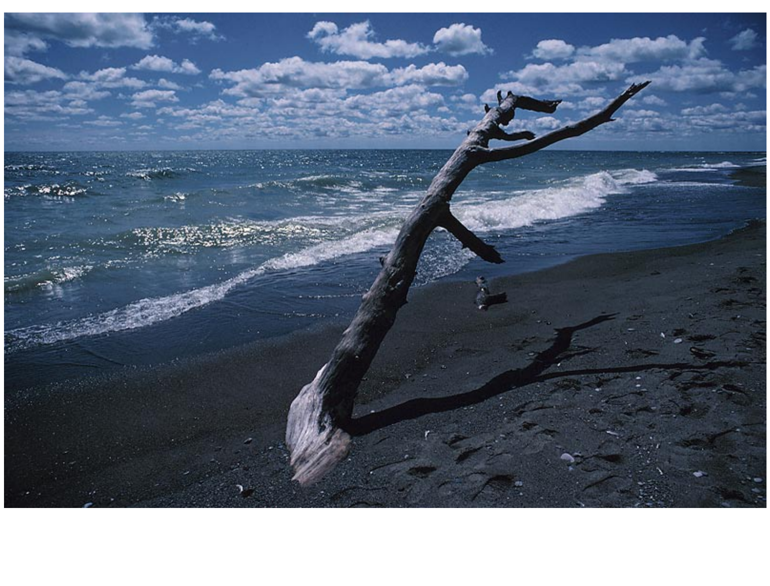
When some trees die they fall into or are washed into a body of water. Most of the time a river will carry the tree downstream to a lake or the ocean. As the tree bobs along, occasionally getting stuck on a sand or mud bar or in shallow water, some of the branches may break off. These go their own direction.

As these smaller pieces of wood break from the tree they begin to bob with the ripples of the current in the river. They are also rolled along, perhaps over islands of dirt and rocks. Bumping along, they become smooth, the bark and rough edges are worn off. This we call driftwood.

As they float along, these pieces of wood are not able to do anything about how or where they float. They just go along with the current, carried where it goes. They are also blown about by the wind. Driftwood is good for nothing but burning, unless a skilled person picks it up, works it over, and makes it into a useful article.

Many of us are like driftwood. We just drift along with the crowd. Where they go, we go, because we have no purpose. However, we can find a purpose for our lives if we will put them in the hands of the Master Craftsman. Jesus is waiting for us to quit our drifting and put our lives into His hands so He can make something beautiful out of them.

I invite you this morning to put your life in the hands of Jesus. Ask Him to take your life and give it a purpose and make something beautiful out of you today.



Co-evolution

That they all may be one; as thou, Father, art in me, and I in thee, that they also may be one in us: that the world may believe that thou hast sent me. John 17:21

Plants and animals adapt to pressures from each other in a process called co-evolution. A biologist was walking along a road in Vera Cruz, Mexico, when he saw a beetle land on a bush. As soon as the beetle landed on the bush, it was driven away by ants. The biologist discovered that the bush was an ants' acacia bush. The ants were protecting their domain; they live on nectar from the acacia.

It appears that the ants also protect these acacias. They make a hole in the thorns of the acacia, and then hollow the inside of the thorn. There they make their home. The queen ant controls her colony from inside these hollow thorns. The hollowing out of the thorns of the acacia plant does not hurt it. The ants keep away other insects and herbivores that might eat parts of the acacia for food. They defend the acacia plant and as a result the plant continues to live and survive. Thus, the ants and the acacia are good for each other.

The biologist took a colony of ants away from some acacia bushes in Mexico. He discovered that the ants didn't like any other vegetation and died off. They liked only the thick syrupy nectar that they harvested from the acacia's leaf tips. Also, the acacia trees died because various insects and other animals destroyed them.

You and I need Jesus, and He needs us. We can go to Him for comfort and shelter when we encounter the storms of life. He needs us to spread His love to others, so they might know about His ever-present protection. We need each other, and as we have that close relationship with Jesus, we will have life and safety.

Ask Jesus this morning to help you keep close to Him today. When your friends want you to do something that you know you ought not do, just whisper a prayer and Jesus will give you the courage to say no.

Vines, Vines, and More Vines

Stand fast therefore in the liberty wherewith Christ hath made us free, and be not entangled again with the yoke of bondage. Galatians 5:1

It seems that the only place that you can avoid vines is in the middle of the desert. Vines are all around us, some of them are useful and some of them are poisonous. Others are simply pests. I have a cartoon of a little boy who was at camp. He came to the nature director with a handful of vines and said, “Look at these new vines that I found.” The picture shows the nature director backing away, because the vines were poison ivy.

There are always some who find interesting vines that they haven’t seen before, and that is probably because there are so many of them. Vines vary in size from that of a thread to as large as a person’s body.

Vines usually grow up on some other natural object. They rely very much on chance on finding something to grow up on. If there is no rock, tree, or other climbable object, they will grow horizontally on the ground. For many vines, the upward climb to light is what keeps them alive. Some vines will just spiral around their object, while others will use barbs, prickles, hooks, thorns, and aerial roots to hang onto the captive object.

The large vines of tropical rain forests that have a woody texture, the kind that children like to swing on, are called lianas. Grapevines also belong to this group. Monkeys and other animals in the jungles and rain forests use the vines that extend from tree to tree to walk, crawl, and jump on. Some of you have rattan furniture in your house. The rattan is a good-sized vine that climbs part way up the tree, attaches itself with spines, and then goes from tree to tree. Rattan palms grow up to 650 feet long and store drinkable water in them.

Christ came and died in this world that you and I as sinners might be freed from the bondage of sin. As the vines wrap themselves around their victims, so sin wraps itself around its victims; only the blood of Jesus can set you free. Thank Him for that freedom today.

Mushrooms

For the earth which drinketh in the rain that cometh oft upon it, and bringeth forth herbs meet for them by whom it is dressed, receiveth blessing from God. Hebrews 6:7

Mushrooms need a lot of moisture to grow. Most of the moisture they need comes from rainfall. There are about 5,000 known species of mushrooms in North America. About 100 of them are poisonous, but only about a dozen of these are deadly. The others can make you so sick you might think you are going to die, but you probably won't. Our advice is, don't eat any mushroom unless you are sure it is edible.

The science of studying mushrooms has become popular. Those who study them are called mycologists. They are constantly on the lookout for more mushrooms, which are classified as fungi.

Mushrooms come in many sizes, shapes, and colors. The colors include red, yellow, blue, green, orange, brown, black, and violet. They range in size from about the size of your little finger to one that will fill a shopping cart. They look variously like umbrellas, cups, bowls, balls, brains, coral, and other objects. Mushrooms spread and reproduce by means of spores. The large puffball mushroom has the capacity of spreading several trillion spores. One mycologist said that if every spore of the mushrooms took seed and grew, we might suffocate in fungi.

As I mentioned above, use caution in picking mushrooms to eat. Be sure you have correctly identified them and know that they are safe for eating.

God has given us many good things but Satan has added some counterfeits. Whether it is in the food you eat or in the ideas you entertain, be certain they are genuine and beneficial. Read your Bible regularly and carefully, that you will not be deceived with wrong ideas or thoughts. Pray that God will help you distinguish between a happy life and one filled with sadness.

Chemical Warfare

Bless them that curse you, and pray for them which despitefully use you. Luke 6:28

We hear much in the world about "chemical warfare" and how we should be against it, but in God's natural world there is much chemical warfare going on everyday. We have discussed the trees and their leaves, and how they protect themselves against insects. One researcher said that when we see a tree being taken over by insects it is because the tree is not growing in good ground and getting proper nutrients.

We do not generally think of the plants as being aggressors in combat, but in many instances they are. They will go right after the avenger, and usually win. Bay leaves and cucumbers send cockroaches scurrying for the exits. Goldenrod, mushrooms, and marigold plants produce light-activated chemicals that actually burn holes in the insects' cell walls.

In the Caribbean Sea there are some seaweed plants that emit a chemical that makes seaweed-eating fish sick, or kills them. Leaves and roots of black walnut trees, sunflowers, creosote bushes, and wild cherries secrete toxic chemicals that sometimes poison neighboring plants and make room for their own seedlings. We have talked about the pitcher plants. There are other insect-eating plants, but the bladderwort is unique. It has underwater "trapdoors" that are open when a small pond animal, such as a water flea, nudges it. As this door opens, the water flowing in takes the small creature with it, and the door slams shut. The Venus's-flytrap has leaves that look like an open clam. As the insect lands on it, the plants send electrical impulses that stimulate the leaf cells. This causes the cells to enlarge and with a sudden growth expansion, the trapdoor closes, all in a matter of seconds.

How God created all of these wonders we may never know, but we can be sure that He is a God of love. He counsels us to love our enemies, not eat them up. Ask God today in your prayer to help you be a lovable Christian today, and not "eat up" your enemies with gossip.

Hot-Blooded Plants

Every plant, which my heavenly Father hath not planted, shall be rooted up. Matthew 15:13

People burn fat in their bodies, and birds burn fat. But plants burn carbohydrates, which are sugars and starches that are manufactured from water, sunlight, and carbon dioxide. Plants also have fat cells called lipid cells. These lipids must be converted to carbohydrates, which is done in the cells, where some structures called glyoxysomes provide the enzymes necessary for the chemical change before they can be used by the plant.

Skunk cabbage is a plant that takes advantage of turning the lipids to carbohydrates by heat-producing cells. No one has yet determined how skunk cabbage and some of its cousins regulate their "floral furnaces." Apparently they are operated by some kind of thermostat. Imagine there is snow on the ground and the weather is cold. Yet during the months of February to April, skunk cabbage will poke its head up through the snow into the cold air, and bloom. The bloom will last for about two weeks. During that time the temperature inside the center of the blossoms and plant is 72° F.

The spike-like bloom of the skunk cabbage is called a spadix; it is shrouded by an insulating hood called a spathe. This spathe is what helps maintain the temperature inside the plant. The heat intensifies the aroma of the blossoms; which attracts flies and beetles that carry the pollen from flower to flower.

Why would God be so interested in a little skunk cabbage that blooms for only two weeks, that He should put a heater inside it? I can't answer this question.

Jesus used many outdoor illustrations. In our text today, He is referring to people as plants; those not of God will not last in the end. God does take care of the plants, and He will take care of us. Thank Him this morning that He is a God of love, and ask Him to guide and take care of you through the day.

An Apple a Day

And I went unto the angel, and said unto him, Give me the little book. And he said unto me, Take it, and eat it up; and it shall make thy belly bitter, but it shall be in thy mouth sweet as honey. Revelation 10:9

You've not doubt heard the saying "An apple a day keeps the doctor away." Apples provide pectins and an acid that help in digestion, as well as bulk and water that help in the body functions. The natural fiber in apples helps in controlling cholesterol levels in the human body. Maybe that is why this expression came into existence.

Wildlife have also discovered that wild apples and apple trees are especially good to eat. Deer and grouse have an appetite for apple leaves. Scientists report that the leaves have more calcium and vitamin A in the carbohydrate-type food than the apple fruit itself. Mice, porcupines, deer, and rabbits like the inner bark of the apple tree. The bark contains more carbohydrate than the leaves. The seeds are enjoyed by birds and squirrels as well as by other animals that eat the whole apple. The seeds contain the most concentrated dose of nutrition.

Ruffled grouse, ring-necked pheasants, and bobwhites like the apple buds as well as the fruit and seeds. In New England, ruffled grouse ate so many of the apple blossoms that the crops of apples were endangered, since the blossoms are what turn into the apples. For some years, in some Massachusetts townships, there was a bounty of 25 cents for each grouse shot or killed. In New Hampshire, a law in 1915 required the state to pay to apple growers a sum of money for crops damaged as the result of wildlife that were on the protected list. Since 1972, no money has been paid to apple growers.

Apple trees provide a benefit for humans and wildlife. Jesus has suggested to us that His Word should be very attractive to us because in it we can find all the elements necessary to live our spiritual life. Ask Jesus this morning to give you an appetite for God's Word today and in the future, so that you may be nourished by it.

Falling Leaves

The one who listens to you listens to Me, and the one who rejects you rejects Me; and he who rejects Me rejects the One who sent Me. Luke 10:16

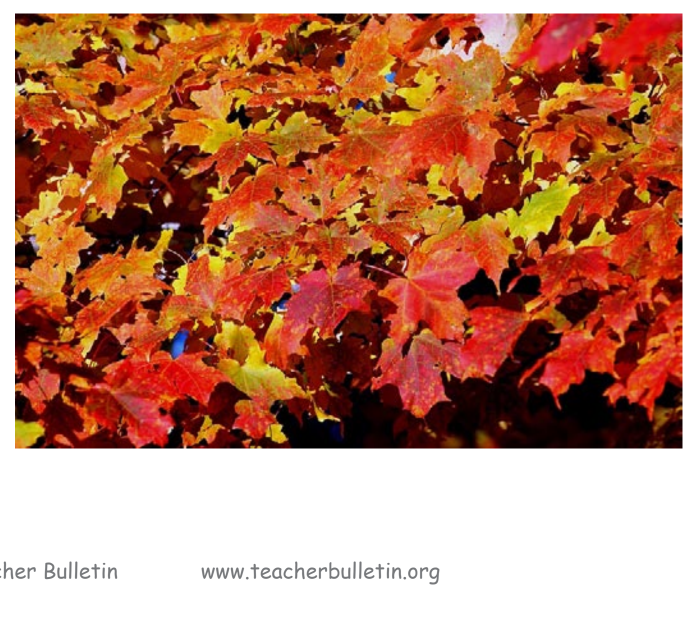
Let me share a parable with you. One day a leaf saw other leaves floating from place to place and decided that would be fun. So the leaf said to the tree it grew on, "I don't need your sap anymore. See how pretty I am? I can take care of myself and I want to be free like the other leaves." The leaf detached itself from the tree and floated in the breeze to the ground. It made friends with the other leaves as it went from place to place. Life seemed to be very exciting.

One day, the leaf noticed that its beautiful color was beginning to disappear and brown spots were developing. A few days later, all its surface had turned brown and life wasn't exciting anymore. Some of its friends had already died, and it was beginning to feel sick. It didn't float from place to place anymore. It had been put into a pile with the other leaves, and it wasn't long until it was dead and burned up by fire. It had completely rejected the life-giving sap offered to it by the tree, and now it was too late!

The pleasures of sin are fun for a while, but they are not things that make us truly happy for any length of time. They bring only temporary satisfaction. The leaf in our parable thought it would be great to be free and do what it wanted, but it found out that it was fun only for a while and ended in destruction by fire.

There are occasions when some young people reject help from their parents, teachers, and others. They feel that they are big enough now and can succeed on their own. But later they have found that this was not the wise course to follow, and they have returned home, like the prodigal son, for the help and love they needed.

We cannot reject Jesus and expect to live forever because He says, *"Without me ye can do nothing."* (John 15:5) We don't need to worry about that fire if we keep a close relationship with Jesus every day. Ask Him to help you be a beautiful Christian today.



Drinks Around the World

Let us eat and drink; for tomorrow we die. 1 Corinthians 15:32

I have always enjoyed different fruit juices. When I went to South America I found many drinks that I didn't know existed. People who travel to the United States find drinks such as root beer that they hadn't known before.

Around the world, God has given many different things to drink, and man has made others that God didn't plan for him to make. When sin entered, man decided to do some things his way; he has paid for it through poor health and death.

People in Brazil make a drink from the guarana (gwar-ANN-na) fruit. This is kind of a national drink and is usually carbonated. They also mix avocado, sugar and milk to make a drink called abacatada (a-BAA-ka-ta-da). They also make ice cream out of it. Brazilians make a drink from a palm fruit called assai (ah-SIGH-ee). It is usually very thick and a deep purple. Juice is also squeezed from sugarcane. People like to suck the cana (CON-ya) right from the stalk.

Coconut milk is a common drink, not only in South America but in other tropical places. Pineapple, guava, orange, grape, grapefruit, passion fruit, and other tropical fruits make nice refrescos, as the Peruvians call their drinks. Many people will take grains such as wheat, rice, barley, corn, oats, and rye and make "cereal coffee" from them. They toast them first, and then boil them to make the "coffee." They will also take many leaves from shrubs and trees and make "teas" out of them. My favorite from Peru is a sweet grass that yerba Louisa is made from. Oh, it is good. Apple leaves, lime or lemon leaves, garlic, and many grasses are used to make teas.

I have had many people offer me drinks that were fermented but these destroy the brain and I have said no. Why numb the brain when there are so many good things to drink that are pure and sweet? God doesn't want us to just eat and drink because we are going to die. He has better plans for us—a good life for eternity. Thank Him for that plan, and enjoy the "good" drinks.

Trilliums

And after three months we departed in a ship of Alexandria, which had wintered in the isle. Acts 28:11

Winter is a long, drawn-out season to many people, especially those who live in the cold and snow. They have to fight it for many months. There are many winter sports enthusiasts who feel that winter is not long enough, but in many areas of the world, winter is not a welcome season of the year.

During the winter months there are many things that slow down and almost stop because of the cold. Many plants and animals become dormant during the winter, while some just slow down their activity. Others seem to prepare for the spring and summer that will come. There are many people like that too.

One of the plants that I especially like to watch for as the snow begins to melt is the trillium. To me, trilliums are some of the most beautiful flowers that exist, and they start to bloom as the snow leaves the ground. They have been preparing for this moment.

Trilliums belong to the lily family. I am aware of six or seven varieties of trilliums. The one that I was describing that comes out, even in the last remnants of snow, is the snow trillium. It has beautiful white petals. All trilliums bear single flowers with three petals, three sepals, and six stamens, and there are three whorled leaves on the stem.

The reflexed sepal and the sessile flower trilliums have purplish-brown petals. The large-flower variety has large white petals that turn pink with age. The Gleason's trillium has a long stem and bends down, but should not be confused with the nodding trillium. Walpole's trillium also is purplish, but has cream-colored stamens.

Paul and his fellow travelers waited out the winter in Malta, and then proceeded on their journey. Trilliums wait out the winter, and then perform in all their beauty, demonstrating God's love for life and beauty. Many times in our Christian experience, we run into a winter experience where all seems bleak and dreary. God invites us to come to Jesus; He will brighten and beautify our day. Ask Him this morning to bring the beautiful "spring" into your life - that you might radiate like the beautiful trillium.

Flame Flower

And he shall be like a tree planted by the rivers of water, that bringeth forth his fruit in his season; his leaf also shall not wither; and whatsoever he doeth shall prosper. Psalm 1:3

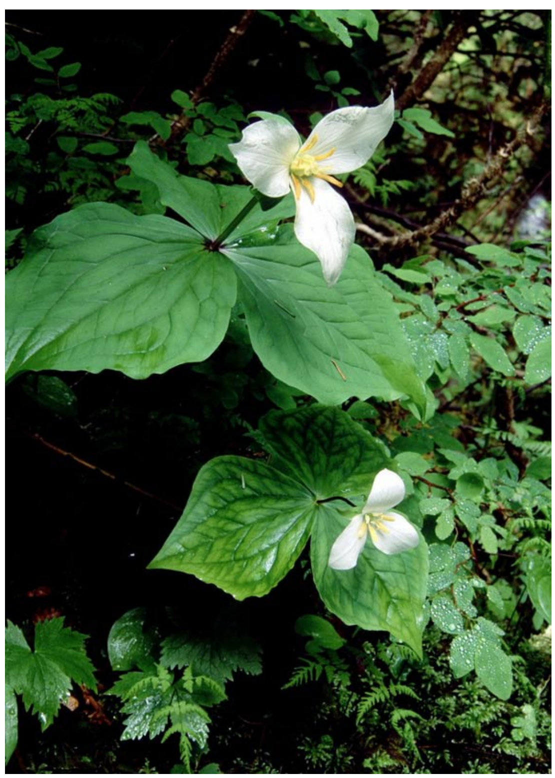
One of the largest multimillion-dollar plant businesses in the world is the raising and selling of poinsettia plants. It all started back in the mid-1820s when a man named Joel R. Poinsett of Charleston, South Carolina, was sent as the first United States ambassador to Mexico. As Mr. Poinsett walked through the hills and valleys around Mexico City he came across some crimson shrubs that were from six to 16 feet high. The Mexicans called the "flame flower." In English they have taken the name "poinsettia."

What especially interested Mr. Poinsett was the bright crimson color. Botanists tell us that the crimson parts are not really petals but bracts. The bracts surround the real flowers, which are clusters of little yellowish-green buttons.

The "flame flower" has become a symbol of Christmas. In California, there is a ranch that grows nothing but poinsettias, under 20 acres of fiberglass roofing. If the temperature is not just right, or the soil is too soggy, the plant will lose its leaves. Then, of course, the color is gone. This ranch has produced a plant that will hold its leaves longer than most varieties.

The Bible writer likens the righteous person to a plant or tree that will not lose its leaves. That person will continue to be a beautiful tree, and others will be introduced to Christ through his or her life. Jesus wants us to show our true color as a Christian and let others know about Him.

It does take a lot of care to make a poinsettia pretty and keep it that way. Jesus is willing to spend time in helping us to remain pretty, if we will let Him. Ask Him today to help you be a true Christian and allow others to see your true color—a life that radiates Jesus.



A Prickly World

And lest I should be exalted above measure through the abundance of the revelations, there was given me a thorn in the flesh, the messenger of Satan to buffet me, lest I should be exalted above measure. 2 Corinthians 12:7

Cacti are considered to be all-American plants because all but one of the more than 1,500 species are confined to the Americas, from Canada to the tip of South America. The hub of most of the cacti is the near-desert land of northern Mexico and the southwestern United States.

When we think of the cactus, we immediately think of the spines, or stickers, that most cactus plants have. Those spines are the reason why different ones of the cactus plants have been named pincushion, hedgehog, porcupine, eagle claw, prickly pear, and fishhook. Not only do the spines of the cactus plant keep away animals that would eat it, but they also play a very important part in the life of the plant.

Spines have the important function of helping the plant live in the hot desert temperatures. Have you ever wondered how cactus plants live where it is so hot? Here is how. The spines screen the sun's rays and help keep the plant cool by trapping an insulating layer of air close to the plant. They reduce evaporation by breaking up the drying winds and air currents, and they collect raindrops and dew, gently dropping this water to the ground beneath the plant where it can soak up the moisture.

Spines come in different sizes and shapes. They always are in clusters, in rows, or in spirals, and grow from spots on the plant called areoles. Some spines are short and stout, while others are long and straight. Some are curved, others are barbed, hooked, feathered, or hair like.

The apostle Paul talked about a thorn, a problem, in his life. Some people, like the cactus, just naturally live a thorny life. However, with Jesus in the life it will be less thorny. Not all of the thorns will be removed because they help us develop a patient character. I thank God for the thorny growing experiences; what about you?

Palm Trees

The righteous shall flourish like the palm tree: he shall grow like a cedar in Lebanon.
Psalm 91:12

There are many types of palm trees around the world, and many of these are quite useful. In the country of Israel I saw beautiful date palms with very large dates on the trees. Date palms are also cultivated in the state of California; that is where the majority of the dates are grown that are eaten in the United States.

In the country of Peru, in South America, there are palm trees that have other types of fruit. The aguaje (a-GUAW-he) palm produces a fruit that is barrel-shaped, about three inches long, with scales for skin. The Peruvians peel the skin off with their teeth and eat the meat of the fruit, which is only about one fourth of an inch thick. They also make a drink and ice cream out of this fruit.

The country of Brazil, also in South America, has probably the largest variety of useful palm trees. There is the carnauba palm with a very large, fan-shaped leaf that produces wax. From these trees companies harvest the wax that is used on automobiles and wooden floors, as well as in some furniture polishes. There is also a very famous tree called the chonta or palmito palm. People cut these trees down and harvest the heart of the tree. This is cut up into pieces or strips like ribbon and cooked, or served raw in a salad; it is very good.

From a certain type of palm tree in Brazil, people gather the fruit, squeeze the juice, and make a drink called assai (as-SIGH-ee). It is a very nutritious drink. Still another palm tree produces nuts; the Brazilians make cooking oil from them.

In His creation, God created all types of trees for man's use, and man has made use of most of them. Interestingly enough, most of the palm trees grow rapidly and straight and usually flourish well in hot desert areas. As Christians, we are to grow, with God's nurture, like the palm trees and bear fruits of righteousness to our friends and neighbors. Ask God to help you bear fruit to someone today as you associate with your friends.

Mangroves

For he shall be as a tree planted by the waters, and that spreadeth out her roots by the river, and shall not see when heat cometh, but her leaf shall be green; and shall not be careful in the year of drought, neither shall cease from yielding fruit. Jeremiah 17:8

Mangroves are an important part of the ecosystem, necessary to preserve the lives of many creatures. Mangroves are found all over the world. They are not the nicest-looking things, but very important. A mangrove thicket consists of hundreds, yes, thousands of trees that grow by the edge of water or in the water. Their prop (aerial) roots project into the water and get tangled with other roots. They look like a tangled mess. They are anything but pretty but have a land-forming function from the deposited silt and debris that collects around them.

A mangrove swamp can be a forbidding place. It generally has a spongy mud base; many thousands of creatures live in and around these mangroves. In some areas such as in the tropics, there may be up to 50 varieties of trees in a mangrove thicket. The leaf coverage is dense, and it is difficult for the sunlight to penetrate. Mosquitoes buzz all around the place. Because of their unbeautiful appearance, and the "bother" they are, some people have begun clearing them out to make room for housing developments. But scientists are now finding that this destroys not only the trees but the breeding and living areas for many thousands of wildlife creatures.

How does a mangrove swamp provide life for so many creatures? Let's look. The droppings from the trees, such as leaves and buds, hit the water and are eaten by tiny organisms such as plankton, worms, crustaceans, and mollusks. These then are eaten by larger creatures such as shrimp, mollusks, crabs, and small fish, which in turn are food for larger water creatures such as larger fish, birds, and other water inhibitors.

When we have a personal relationship with Jesus, the Good Book tells us that we will be as a tree planted by the river. We will really be in need of nothing and will bear fruit. That is the way the mangroves are. This morning, talk to Jesus and ask Him to help you through this day to have a good relationship with Him.

Bible Projects and Activities

Think about a plant or tree which possesses some characteristic that could be incorporated into an object lesson. Plan a worship talk around your object lesson and present it to the class or as a children's story at church.

Choose a parable which Jesus told involving a plant or tree. Write it in a book format for young children and illustrate it.

Write a letter to God telling Him how you would like Him to incorporate plants and trees into the home He is preparing for you. Be specific and creative. Draw a picture illustrating your ideas.

Write a song of praise or a poem which includes thoughts of gratitude for God's creative power as seen in the plant world. The song may be sung to a familiar tune. Teach your song to the class or illustrate and read the poem to them.

Make a pop-up card with flowers for a shut-in or nursing home resident. (See art section for patterns.) Include in the card comments about what you have been studying and how you have learned to appreciate God as a creator. Take the card with a plant you have grown to the person for whom you designed it.

Raise a variety of plants to sell. Ask the Holy Spirit to show you how He would like the profits to be used. Send the money to the person or organization He revealed to you with a letter explaining how you were led to help them.

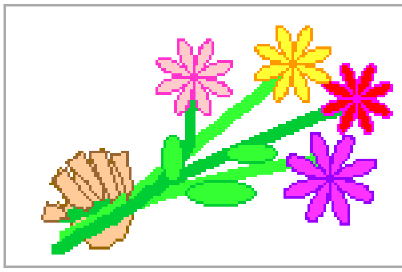
Identify an elderly or disabled person who needs help with yard work. Go to their home (with parents' permission) and do the work that needs to be done. Tell them about the Jesus you love and how He motivated you to do this act of service.

Plant a vegetable or herb garden and tend it carefully. Share the produce with a local food bank, community services center or family in need. Look for an opportunity to tell them about Jesus.

Dramatize the parable of the sower. Make or collect relevant props. Present it to the class or in church.

Choose three scriptural references to trees or other plants. Copy the verse in your best handwriting and illustrate it.

Flowerly Crafts



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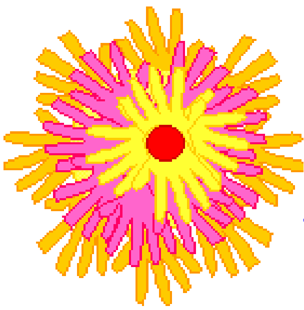

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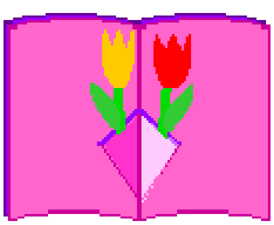

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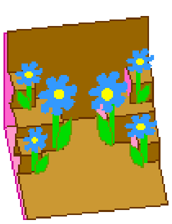

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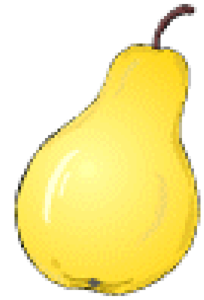


I Want to Know
Unit Four, Lesson Fourteen
Teacher's Edition

Discussion questions

1. **What were some of the first problems that confronted Dr. Carver in his early years?** *Orphan, African American, no schools for his race, no family to provide for him*

2. **Think of some of the skills that he developed that provided him with income and acceptance from those he met and worked for. Which ones were thought to be "women's work"? Did he let his pride hinder him?** *Possible answer: Some of his work included crocheting, gardening and doing housework and laundry. He did not let his pride stop him; he excelled and was able to make money with his skills.*

3. **Have you ever done something you did not like to do only to discover it wasn't as bad as you expected?** *Answers may vary.*

4. **What is something you have thought that you might like to do but are afraid you will not be good enough to succeed? Should you try anyway? Can you think of things people choose not to do because they are afraid they might fail?** *Answers may vary.*

5. **What if Jesus had not been willing to be born on this earth because He was afraid He would fail? From whom did He draw encouragement and help? Do we have that same source available to us?** *Possible answers: We would not have a Savior; Jesus received encouragement from time in prayer with God, reading and memorizing scripture, friends such as Mary, Martha Lazarus and the disciples.*

Activities

A. **In cooperative groups, write situations that challenge one's patience. Exchange situations with another group and brainstorm on solutions. Continue to pass the situations around the class until each group has responded. When each group has their own paper back discuss and prioritize responses.** *Possible answer: waiting for a parent to make good on a promise, having to take care of a younger brother or sister, continuing to practice a skill that is difficult for you to do.*

B. Write an acrostic using the letters in PATIENCE.
Example:

Patience
***P**atience is waiting on God*
***A**lways listening to His voice*
***T**aking time for others*
***I**nvolving one self in a life of service*
***E**ncouraging others to go first*
***N**ever thinking only of one's self*
***C**ompassionately ministering to God's children*
***E**verywhere!*

C. Listen to Spirituals. How does this music show and encourage patience in dealing with unspeakable wrong?

American Negro Spirituals in the Seventh-day Adventist Hymnal: 69, 121, 138, 158, 305, 319, 403, 475, 580, 624, 627

Other common spirituals:
- *Wade into the Water*
- *The Gospel Train*
- *Swing Low, Sweet Chariot*
- *Roll Jordan, Roll*
- *My Lord What a Morning*
- *I'm Troubled in Mind*
- *We Shall Overcome*

Negro Spirituals are hymns that were written by slaves. Many African Americans believed that their slavery was similar to the experience of the Israelites in Egypt. They hoped that God would deliver them just as He had the Israelites. Because of this belief many of the Spirituals refer to Moses and Pharaoh. Slaves knew that this world was not their real home and that someday they would be free.

D. Go outdoors and try "still hunting." Quietly select a place to observe. Sit quietly and see if you notice any animals or birds. Journal about your experience.

See Teacher's Resources at back of Teacher's Edition for more ideas (page 40)

<u>Dig a Little Deeper</u>

1. Examine the life of George Washington Carver and classify the important events of his life into three categories: Early childhood, Adolescent years, Adulthood. Include at least three events for each category. How did he display patience and perseverance throughout his life?

2. George Washington Carver was a rare man. He put service for others above riches and fame. The epitaph on his grave read, "He could have added

fortune to fame, but caring for neither, he found happiness and honor in being helpful to the world." Study the following quotations written by Carver and choose one to write in your own words giving advice to another young person or yourself.

"It is not the style of clothes one wears, neither the kind of automobile one drives, nor the amount of money one has in the bank, that counts. These mean nothing. It is simply service that measures success."

"How far you go in life depends on your being tender with the young, compassionate with the aged, sympathetic with the weak and the strong. Because someday in life you will have been all of these."

Answers may vary.

3. Paul's persistence

- Read the following passage:

  "Through his long term of service, Paul had never faltered in his allegiance to his Saviour. Wherever he was--whether before scowling Pharisees, or Roman authorities; before the furious mob at Lystra, or the convicted sinners in the Macedonian dungeon; whether reasoning with the panic-stricken sailors on the shipwrecked vessel, or standing alone before Nero to plead for his life—he had never been ashamed of the cause he was advocating. The one great purpose of his Christian life had been to serve Him whose name had once filled him with contempt; and from this purpose no opposition or persecution had been able to turn him aside." *Conflict and Courage*, page 356.

  What is the underlying theme of this passage? What were some of Paul's challenges? How are Paul and George Washington Carver similar?

  Possible answers: In spite of the difficulties Paul faced, he persisted in His allegiance to his Savior and the work he was called to do; challenges included shipwreck, imprisonment, angry mobs, etc.; both Paul and George Washington Carver faced challenges and persevered.

- Read 2 Timothy 4:2. What advice does Paul give about persistence?

  Possible Answer: Paul tells us to be persistent in sharing God's word.

- Read 2 Timothy 4:6-8; write an epitaph for Paul.
  Answers will vary

4. George Washington Carver worked very hard his entire life for higher education. He felt that it was both necessary and valuable for him. Judge the value of a higher education in today's society. Write a 1 to 2 paragraph essay, defending your position on whether or not a higher education is necessary.
Answers may vary

Name________________________________ Dig a Little Deeper 1

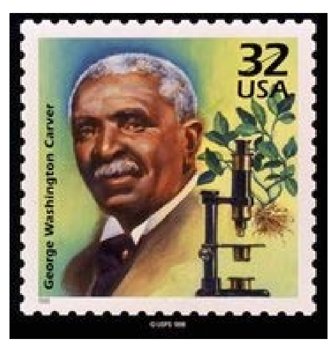
FROM SLAVERY TO SUCCESS

Examine the life of George Washington Carver and classify the important events of his life into three categories: Early childhood, Adolescent years, Adulthood. Include at least three events for each category.

Early childhood	*Adolescent years*	*Adulthood*
• *Orphaned* • *Not allowed to go to school* • *Learned how to crochet* • *Decided he wanted an education* *Worked well with plants*	• *Walked to Missouri and boarded with Mrs. Watkins* • *Went to school for the first time* • *Traveled from town to town, working along the way* *Learned about God*	• *Owned property* • *Owned a laundry business* • *Accepted and then rejected from Highland University* • *Tried homesteading* • *Enrolled in Simpson College* • *Received his master's degree* *Opened Tuskegee Institute*

How did he display patience and perseverance throughout his life?

Possible Answer: He was determined to get an education so moved several times and worked many different jobs to reach his goal; although he was turned away from many schools, he persisted until he was able to earn Bachelor's and Master's degrees; he conducted countless scientific experiments and invented numerous products.

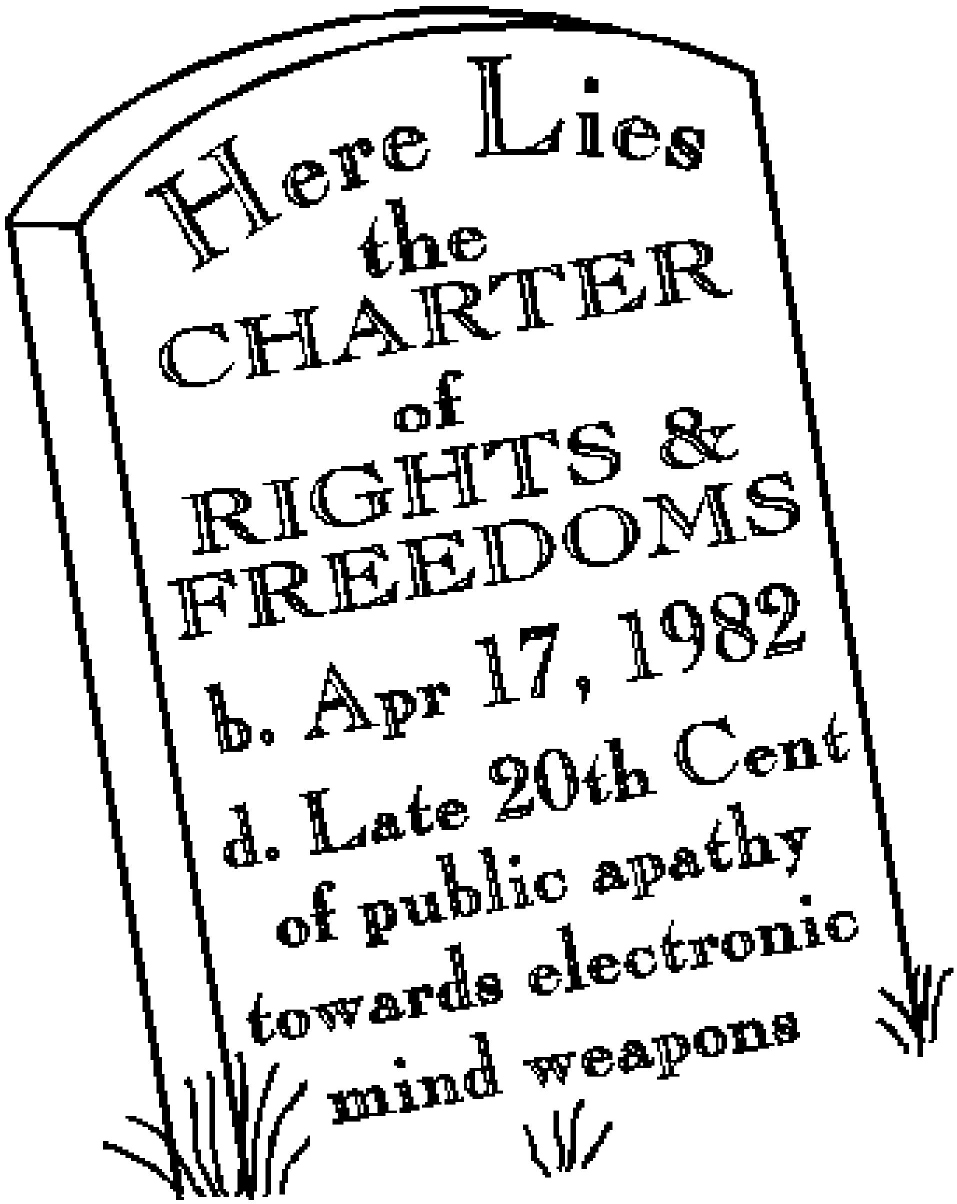


Name___________________________________ Dig a Little Deeper 3

Here Lies Paul

An epitaph is the writing on a gravestone in memory of the person buried there. Write an epitaph for Paul.

Note to artist: Recreate tombstone, with title: Here Lies Paul. Remove remaining words – leaving blank template for students to fill in.



Unit 4, Lesson 14

Name_____________________________________ Supplemental Activity

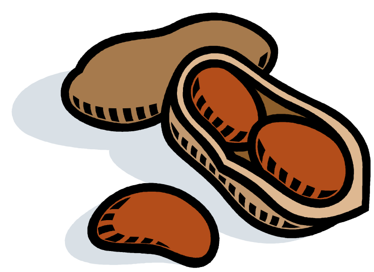
Peanut Soup?

In 1925 George Washington Carver wrote Bulletin 31 “How to Grow the Peanut and 105 Ways of Preparing it for Human Consumption.” Find this bulletin on the internet at

<http://aggie-horticulture.tamu.edu/plantanswers/recipes/peanutrecipes.html>

Create a graph that shows the number of recipes George Washington Carver created using peanuts in the following ways:

Soups
Salads
Entrées
Breads
Desserts



Choose one recipe to prepare at home. Bring to school for a taste fair.

Unit 4, Lesson 14

Name_______________________________________ Supplemental Activity

What Do You Think About George?

With a partner, create a series of five mock interviews with people who were significant in George Washington Carver's life. Ask them questions about what they think of George and his accomplishments. Record the interviews on audiotape or videotape.

Unit 4, Lesson 14

Name________________________________ Supplemental Activity

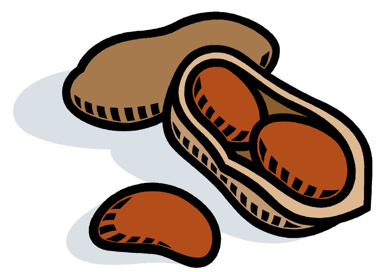
Peanut Soup?

In 1925 George Washington Carver wrote Bulletin 31 “How to Grow the Peanut and 105 Ways of Preparing it for Human Consumption.” Find this bulletin on the internet at

<http://aggie-horticulture.tamu.edu/plantanswers/recipes/peanutrecipes.html>

Create a graph that shows the number of recipes George Washington Carver created using peanuts in the following ways:

Soups
Salads
Entrées
Breads
Desserts



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Unit 4, Lesson 14

STUDENT PAGES

I Want to Know
Unit Four, Lesson Fourteen

Dig a Little Deeper

1. Examine the life of George Washington Carver and classify the important events of his life into three categories: Early childhood, Adolescent years, Adulthood. Include at least three events for each category. How did he display patience and perseverance throughout his life?

2. George Washington Carver was a rare man. He put service for others above riches and fame. The epitaph on his grave read, "He could have added fortune to fame, but caring for neither, he found happiness and honor in being helpful to the world." Study the following quotations written by Carver and choose one to write in your own words giving advice to another young person or yourself.

"It is not the style of clothes one wears, neither the kind of automobile one drives, nor the amount of money one has in the bank, that counts. These mean nothing. It is simply service that measures success."

"How far you go in life depends on your being tender with the young, compassionate with the aged, sympathetic with the weak and the strong. Because someday in life you will have been all of these."

Answers may vary.

3. Paul's persistence
   - Read the following passage:

     "Through his long term of service, Paul had never faltered in his allegiance to his Saviour. Wherever he was—whether before scowling Pharisees, or Roman authorities; before the furious mob at Lystra, or the convicted sinners in the Macedonian dungeon; whether reasoning with the panic-stricken sailors on the shipwrecked vessel, or standing alone before Nero to plead for his life—he had never been ashamed of the cause he was advocating. The one great purpose of his Christian life had been to serve Him whose name had once filled him with contempt; and from this purpose no opposition or persecution had been able to turn him aside." *Conflict and Courage*, page 356.

     What is the underlying theme of this passage? What were some of Paul's challenges? How are Paul and George Washington Carver similar?

- Read 2 Timothy 4:2. What advice does Paul give about persistence?

- Read 2 Timothy 4:6-8; write an epitaph for Paul.

4. George Washington Carver worked very hard his entire life for higher education. He felt that was both necessary and valuable for him. Judge the value of a higher education in today's society. Write a 1 to 2 paragraph essay, defending your position on whether or not a higher education is necessary.

Name________________________________ Dig a Little Deeper 1

FROM SLAVERY TO SUCCESS

Examine the life of George Washington Carver and classify the important events of his life into three categories: Early childhood, Adolescent years, Adulthood. Include at least three events for each category.

Early childhood	*Adolescent Years*	*Adulthood*

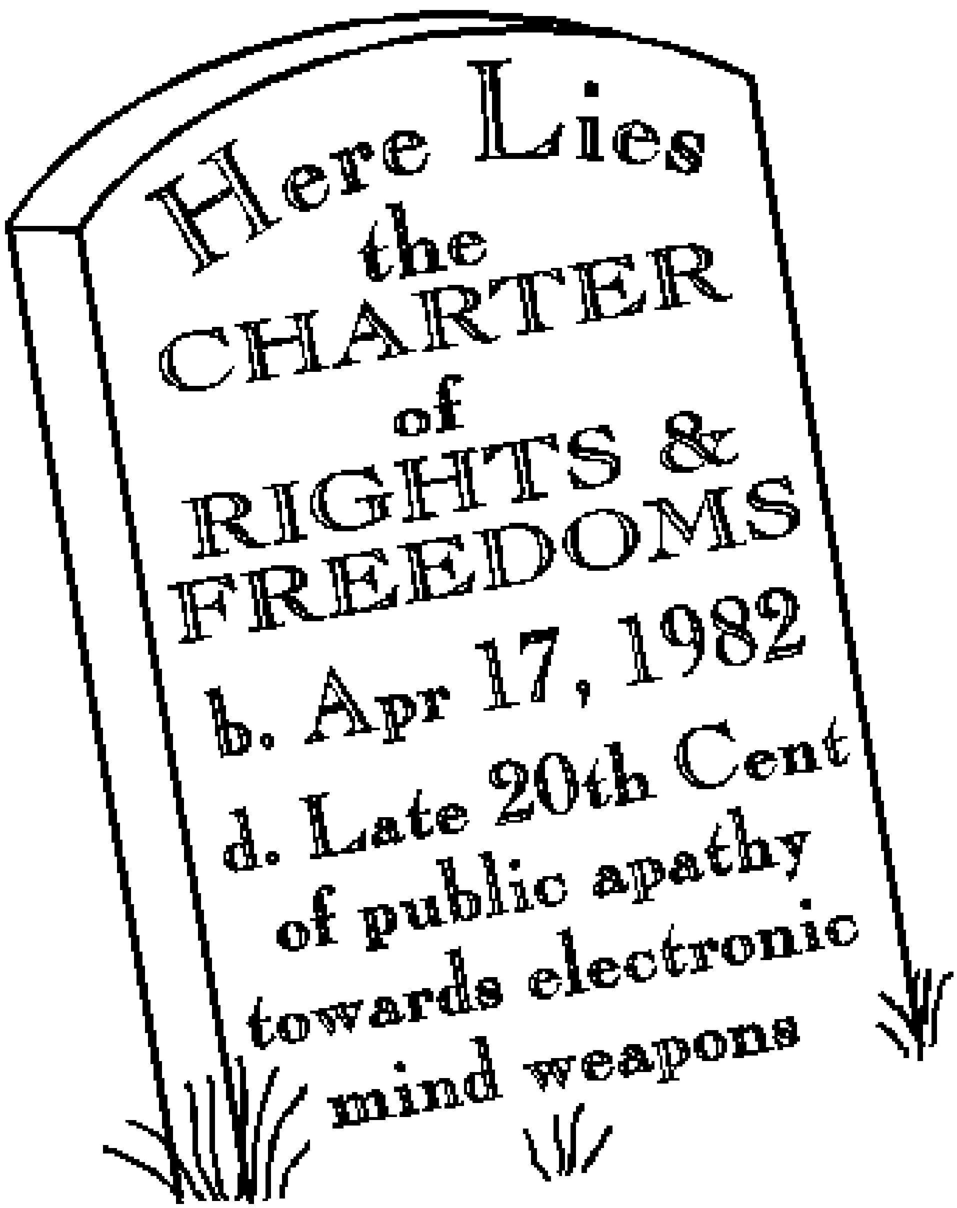
How did he display patience and perseverance throughout his life?

Name_______________________________________ Dig a Little Deeper 3

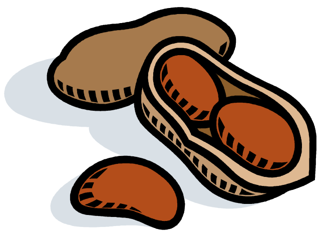
Here Lies Paul

An epitaph is the writing on a gravestone in memory of the person buried there. Write an epitaph for Paul.

Note to artist: Recreate tombstone, with title: Here Lies Paul. Remove remaining words – leaving blank template for students to fill in.



Unit 4, Lesson 14



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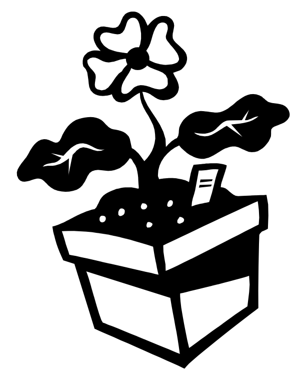
Unit 4, Lesson 14

Plant Journal



by ________________

Date ____________

Date

Date

Date ____

Date ______

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Date ______

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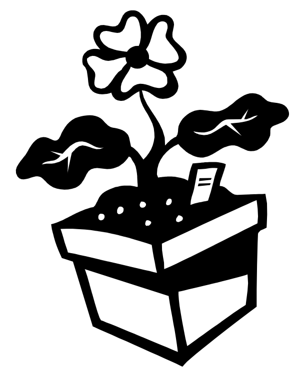
Date

Plant Journal



by ______________

Date ________

Date ________

Date ____________

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Date ________

Date ________

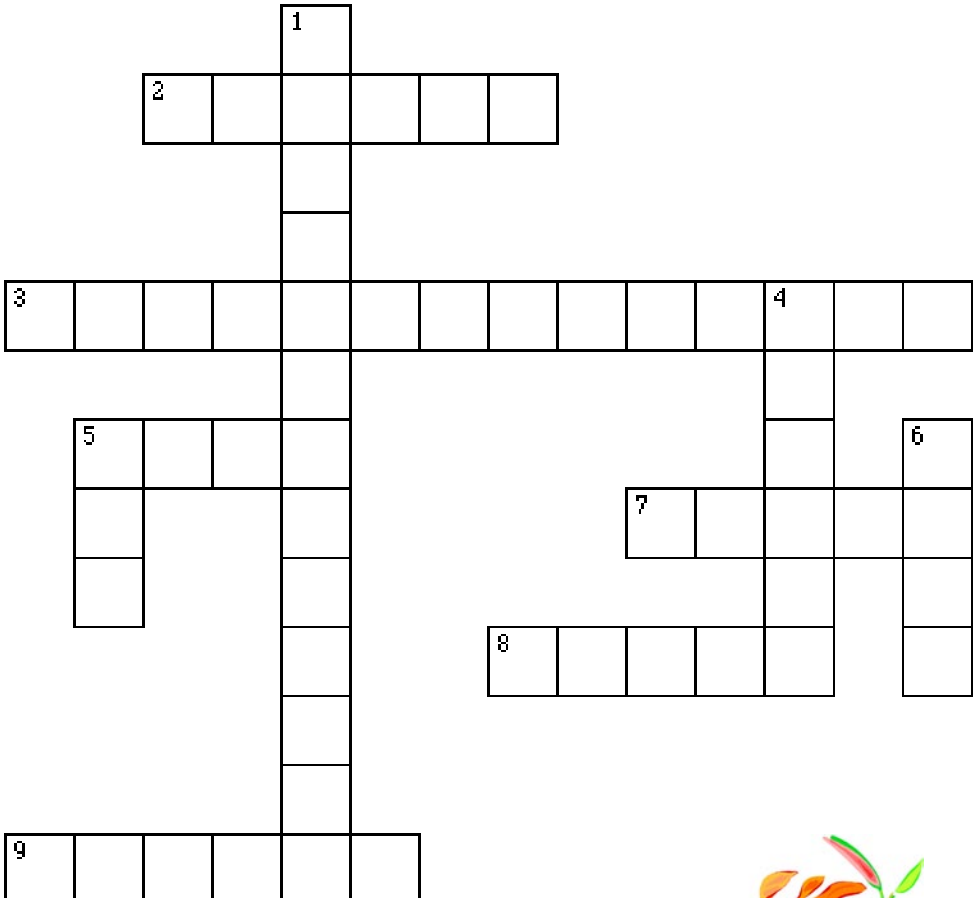
Sprouting Letters

Have younger children plant quick-sprouting seeds (bird seed or grass seed) in the shape of the letter of the week or their own initials. Place soil in a shallow container and lightly trace the letter or letters in the soil. Then sprinkle the seeds in the shape of the letter(s). Mist with a spray bottle and watch the letters grow.

Older students might each choose a spelling word to create with seeds. Students who are learning a specific word family or phonics pattern could each grow one of the words in the family or pattern.

Plants

Name__________________________ **Date** __________________________



ACROSS

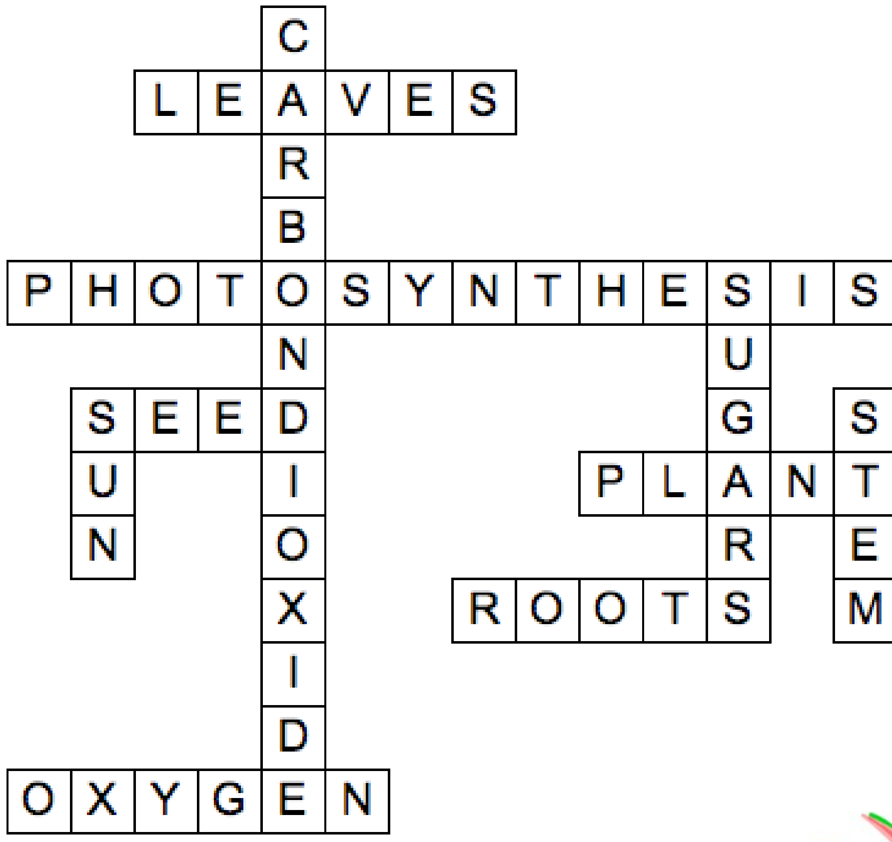
2. Where plants make their food
3. The process when plants make their food
5. Holds the beginnings of a new plant
7. All plants are part of this kingdom
8. They take in water and minerals
9. Humans get this from plants

DOWN

1. One thing the plant needs for photosynthesis
4. The name for the food that a plant makes
5. The source of all energy
6. A "transport" system

Plants

Name KEY **Date** ______________________



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6. A "transport" system

Plant Poetry

Name ______________________________ Date ____________________

Directions: Use this poem to write a poem about plants.

You could also use this form to make a booklet about plants. Cut the form out and staple the pages together.

Plant Fun

Name ______________________________ Date __________________________

Directions: Unscramble each of the clue words. Then take the letters in the circles and unscramble them for the final message.

EESB

DUSB

FITTEUSERLB

LOEFWSR

NEGER

VAELES

ATPEL

LPTAN

SOTRO

SEESD

LATSK

METS

LISTUHNG

WATRE

C

Searching for Flowers

Name ______________________________ Date __________________________

P	H	T	S	H	A	Q	S	I	R	E	D	Z	C	X
Y	E	T	E	I	Z	W	H	C	E	T	L	I	A	L
V	E	R	L	U	A	O	R	C	H	I	D	N	R	G
M	I	H	I	S	Q	T	J	M	T	C	G	N	N	F
Y	A	O	T	W	P	U	A	T	A	L	R	I	A	M
D	S	E	L	A	I	R	O	B	E	A	O	A	T	V
Z	R	I	R	E	I	N	W	B	H	T	S	M	I	G
P	G	E	A	G	T	X	K	Q	F	E	E	H	O	X
W	C	A	O	D	D	U	B	L	T	P	P	R	N	M
B	N	L	E	D	Q	L	Y	Y	E	M	O	O	L	B
L	D	T	U	L	I	P	D	I	W	Z	R	U	D	X
D	T	M	I	O	P	Z	X	B	R	P	I	P	Z	Z
M	O	S	S	O	L	B	W	D	A	I	J	N	R	D
B	U	N	P	A	F	V	W	T	E	Y	S	U	O	I
Y	N	G	Q	D	B	P	C	I	T	Z	Y	F	L	K

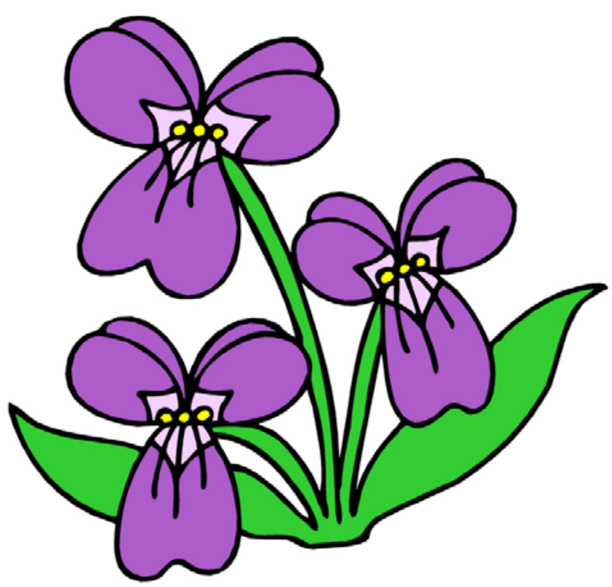
aster
bloom
blossom
bouquet
bud
carnation
dahlia
daisy
heather
iris
marigold
orchid
petal
periwinkle
poppy
rose
stem
tulip
violet
zinnia

Funny Flowers

How would flowers look if their appearance matched their names? Have students create a book using the accompanying form after cutting it in half. On the blank the student records one of the following flower names and then illustrates it on the back side by depicting what it would look like if its appearance matched its name. Bind the pages together and entitle it "Funny Flowers".

Bachelor's Button	Goldenrod	Canterbury Bell
Canary Creeper	Black-Eyed Susan	Bluebell
Sunflower	Dogwood	Pitcher Plant
Rattlesnake Master	Snapdragon	Purple Owl's Clover
Soapweed	Indian Pipe	Tiger Lily
Bluebonnet	Flame Azalea	Wooly Daisy
Bleeding Heart	Teddy Bear Cholla	Foxglove
Skunk Cabbage	Fairy Slipper	Lady's Slipper
Bridal Wreath	Fiddleneck	Indian Paintbrush
Tall Bearded Iris	Firecracker Flower	Beardtongue
Dogtooth Violet		

An additional activity which could follow this one is to read Tomie de Paola's books, **The Legend of the Bluebonnet** and **The Legend of the Indian Paintbrush.** Have students compare and contrast the two books and then write an original legend about one of the flowers above explaining how it got its name.



What would a

____

look like if it

matched it's

name?

What would a

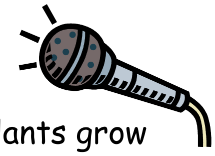
____

look like if it

matched it's

name?

Plant Interview



When was the last time you heard from a plant? Many people believe that plants grow better when people talk to them so why not give it a try? Follow these steps to interview a plant.

#1: Choose a plant to interview. It could be an indoor or outdoor plant or a tree.

#2: Write out a list of questions you would like to ask your plant if you were a news reporter or television talk show host. Then write how you believe the plant would respond to your question. Use an interview format. It should look like this:

Reporter: Tell me what it is like to be a dandelion these days. I understand that a good many home owners would be happier ifyou didn't exist.

Dandelion: It is true. Everyone is looking for a way to do me in. It used to be all I had to worry about was the lawn mower (as if that's not enough!). But these days everybody has one lethal liquid or another they just can't wait to squirt on me. If I weren't a persistent perennial there wouldn't be much chance of my survival. Also, the wind is one of my best allies.

#3: When you have written your interview, ask a friend to join you in preparing to present it to the class. Decide which of you will be the plant and which will be the reporter. Make two copies of your script and practice until you are ready to present the interview to the class. You may want to wear costumes or use props. Consider whether you might want to take additional questions from the audience for the plant to answer. Be sure your questions and answers reveal important information which you have learned in this unit.

Plant Pictionary

Use the following list of words (or modify it to include those words you feel are most appropriate to your group of students) to play plant Pictionary. Divide the players into two teams. Each team identifies its first artist. On a cue to "start" both artists come and look at the first word on the list and race back to the team where they will draw pictures trying to get the team members to say the word which they are illustrating. The person who guesses the word goes to the teacher to get the next word on the list and play continues in this pattern until all the words have been drawn and guessed. The first team to complete the list of words is the winner.

leaf
stigma
stem
roots
pollen
pistil
photosynthesis
flower
ovary
stamen
phototropism
seed
germinate
palmate
style
pinnate
filament
anther
chlorophyll
geotropism
parallel
cell wall
spores
conifer
deciduous
perennial
annual
biennial
vascular
xylem
phloem
cambium
guard cells
palisade cells
sepal
petals
pollination
seed coat
monocot
dicot

Vocabulary Bingo

Copy and distribute a Bingo board to each student or, if young children are playing, to each heterogeneously grouped pair of students. Sixteen different boards are provided. Give each student or pair a small pile of sunflower seeds (in the shell) or some other type of marker. Place the green cards with words and definitions in a container. Draw one out of the bag and read the definition. The students locate the word which matches that definition and place a marker on the corresponding square on their board. You may wish to have students simultaneously read the corresponding definition once they have found it (not all the definitions are on all the boards). The first student or pair of students to mark five squares horizontally, vertically or diagonally wins.

Chlorophyll	Stomata	Pollenation	Pistil	Tropism
Sprout	Dicot	Monocot	Conifers	Petiole
Seed coat	Photosynthesis	FREE	Germination	Petals
Stem	Seed	Evergreen	Transpiration	Leaf
Spore	Taproot	Phloem	Xylem	Vein

Photosynthesis	Phloem	Evergreen	Vein	Seed
Chloroplast	Chlorophyll	Stomata	Leaf	Sepal
Pollenation	Cotyledon	FREE	Dicot	Stamen
Stem	Monocot	Taproot	Root	Sprout
Seed coat	Pollen	Conifers	Germination	Spore

Seed	Conifers	Spore	Transpiration	Sprout
Germination	Monocot	Taproot	Tropism	Photosynthesis
Petals	Dicot	**FREE**	Chlorophyll	Stomata
Pollenation	Petiole	Pistil	Stem	Xylem
Vein	Seed coat	Phloem	Evergreen	Leaf

Sprout	Seed coat	Chloroplast	Leaf	Taproot
Sepal	Stem	Cotyledon	Photosynthesis	Pollenation
Evergreen	Root	FREE	Stamen	Seed
Petals	Germination	Dicot	Monocot	Phloem
Chlorophyll	Stomata	Conifers	Spore	Vein

Pollenation	Chlorophyll	Stomata	Germination	Evergreen
Spore	Xylem	Petiole	Stem	Conifers
Tropism	Photosynthesis	**FREE**	Seed	Sprout
Phloem	Petals	Seed coat	Vein	Pistil
Dicot	Monocot	Transpiration	Leaf	Taproot

Stem	Sepal	Cotyledon	Chloroplast	Seed
Monocot	Spore	Chlorophyll	Stomata	Root
Phloem	Seed coat	**FREE**	Petals	Taproot
Leaf	Photosynthesis	Vein	Sprout	Germination
Evergreen	Dicot	Stamen	Conifers	Pollenation

Spore	Taproot	Tropism	Sprout	Monocot
Phloem	Seed coat	Evergreen	Stem	Transpiration
Pistil	Pollenation	FREE	Petals	Chlorophyll
Stomata	Conifers	Xylem	Dicot	Germination
Leaf	Photosynthesis	Seed	Vein	Petiole

Vein	Photosynthesis	Monocot	Leaf	Dicot
Sepal	Pollenation	Stem	Petals	Taproot
Conifers	Evergreen	**FREE**	Phloem	Seed coat
Chlorophyll	Stomata	Germination	Stamen	Spore
Root	Seed	Cotyledon	Chloroplast	Sprout

Taproot	Monocot	Germination	Xylem	Photosynthesis
Petals	Sprout	Seed coat	Spore	Evergreen
Conifers	Seed	**FREE**	Transpiration	Pistil
Pollenation	Leaf	Stem	Tropism	Phloem
Petiole	Chlorophyll	Stomata	Vein	Dicot

Monocot	Leaf	Chlorophyll	Stomata	Vein
Evergreen	Spore	Petals	Stem	Sepal
Dicot	Taproot	**FREE**	Seed	Pollenation
Cotyledon	Conifers	Photosynthesis	Root	Seed coat
Stamen	Phloem	Sprout	Germination	Chloroplast

Seed	Pistil	Vein	Spore	Phloem
Transpiration	Dicot	Photosynthesis	Chlorophyll	Stomata
Evergreen	Taproot	FREE	Xylem	Stem
Conifers	Pollenation	Sprout	Petiole	Tropism
Petals	Seed coat	Leaf	Germination	Monocot

Seed coat	Root	Pollenation	Sepal	Stem
Conifers	Phloem	Seed	Petals	Monocot
Spore	Photosynthesis	**FREE**	Cotyledon	Chlorophyll
Leaf	Stomata	Vein	Evergreen	Taproot
Sprout	Chloroplast	Germination	Dicot	Stamen

Evergreen	Sprout	Xylem	Pollenation	Taproot
Phloem	Tropism	Germination	Dicot	Pistil
Seed	Stem	**FREE**	Petiole	Conifers
Chlorophyll	Stomata	Spore	Monocot	Petals
Transpiration	Vein	Photosynthesis	Leaf	Seed coat

Photosynthesis	Cotyledon	Taproot	Stamen	Spore
Vein	Seed	Phloem	Sprout	Evergreen
Chloroplast	Monocot	FREE	Conifers	Seed coat
Stem	Petals	Dicot	Sepal	Root
Germination	Chlorophyll	Pollenation	Stomata	Leaf

Taproot	Germination	Transpiration	Chlorophyll	Stomata
Petiole	Pistil	Pollenation	Tropism	Monocot
Photosynthesis	Sprout	FREE	Conifers	Seed
Xylem	Evergreen	Dicot	Spore	Leaf
Seed coat	Petals	Phloem	Vein	Stem

Cotyledon	Dicot	Root	Photosynthesis	Vein
Stamen	Stem	Leaf	Pollenation	Chlorophyll
Stomata	Chloroplast	**FREE**	Sprout	Petals
Sepal	Seed coat	Evergreen	Conifers	Taproot
Phloem	Spore	Seed	Germination	Monocot

Autumn Leaves

Kim Kaiser

Red and orange, yellow, green,
Prettiest colors I've ever seen.
Hanging on the branch so tight,
Will they lose their grip tonight?
Sky is gray, looks like a frown,
Wind blows through and leaves come down.
Summer's gone now trees will rest,
But first they had to look their best.

State Trees and Flowers

State	Type	Name	Latin Name	Year of Legislation
Alabama	Tree	longleaf pine	Pinus palustis	1997
	Flower	camelia	Camellia japonica	1959/1999
Alaska	Tree	Sitka spruce	Picea sitchensis	1962
	Flower	forget-me-not	Myosotis alpestris subsp. asiatica	1917
Arizona	Tree	palo verde	Parkinsonia florida	
	Flower	saguaro cactus blossom	Carnegia gigantea	1931
Arkansas	Tree	lobolly pine	Pinus taeda	1939
	Flower	apple blossom	Malus domestica	1901
California	Tree	California redwood	Sequoia giganteum*	1937/1953
		Sequoia	Eschscholzia californica	1903
Colorado	Tree	Colorado blue spruce	Picea pungens	1939
	Flower	Rocky Mountain columbine	Aquilegia caerulea	1899
Connecticut	Tree	white oak	Quercus alba	1947
	Flower	mountain laurel	Kalmia latifolia	1907
District of Columbia	Tree	scarlet oak	Quercus coccinea	
	Flower	American Beauty rose	Rosa 'American Beauty'	
Delaware	Tree	American holly	Ilex opaca	1939
	Flower	peach blossom	Prunus persica	1895
Florida	Tree	sabal palm	Sabal palmetto	1953
	Flower	orange blossom	Citrus sinensis	1909
Georgia	Tree	live oak	Quercus virginiana	1937
	Flower	Cherokee rose	Rosa laevigata	1916
Guam	Tree	ifil or ifit	Intsia bijuga	
	Flower	puti tai nobiu	Bougainvillea spectabilis	
Hawaii	Tree	kukui or candlenut	Aleurites moluccana	1959
	Flower	pua aloalo	Hibiscus brackenridgei	1988
Idaho	Tree	western white pine	Pinus monticola	1935
	Flower	syringa mock orange	Philadelphus lewisii	1931
Illinois	Tree	white oak	Quercus alba	1973
	Flower	purple violet	Viola****	1908
Indiana	Tree	tulip tree	Liriodendron tulipifera	1931
	Flower	peony	Paeonia lactiflora	1957
Iowa	Tree	oak	Quercus**	1961

	Flower	wild prairie rose	Rosa suffulta	1897
Kansas	Tree	cottonwood	Populus deltoides	1937
	Flower	sunflower	Helianthus annuus	1903
Kentucky	Tree	tulip poplar	Liriodendron tulipifera	1994
	Flower	goldenrod	Solidago canadensis var. scabra	1926
Louisiana	Tree	bald cypress	Taxodium distichum	1963
	Flower	magnolia	Magnolia grandiflora	1900
Maine	Tree	eastern white pine	Pinus strobus	1945
	Flower	eastern white pine tassel and cone	Pinus strobus	1895
Maryland	Tree	white oak	Quercus alba	1941
	Flower	black-eyed Susan	Rudbeckia hirta	1918
Massachusetts	Tree	American elm	Ulmus americana	1941
	Flower	mayflower	Epigaea repens	1918
Michigan	Tree	eastern white pine	Pinus strobus	1955
	Flower	apple blossom	Malus domestica	1897
Minnesota	Tree	red pine	Pinus resinosa	1945
	Flower	pink and white ladyslipper	Cypripedium reginae	1893
Mississippi	Tree	magnolia	Magnolia***	1938
	Flower	magnolia	Magnolia grandiflora	1952
Missouri	Tree	flowering dogwood	Cornus florida	1955
	Flower	hawthorn	Crataegus****	1923
Montana	Tree	ponderosa pine	Pinus ponderosa	1949
	Flower	bitterroot	Lewisia rediviva	1895
Nebraska	Tree	cottonwood	Populus deltoides	1972
	Flower	goldenrod	Solidago gigantea	1895
Nevada	Tree	singleleaf pinyon	Pinus monophylla	1953
	Flower	sagebrush	Artemisia tridentata	1917
New Hampshire	Tree	white birch	Betula papyrifera	1947
	Flower	purple lilac	Syringa vulgaris	1919
New Jersey	Tree	northern red oak	Quercus rubra	1950
	Flower	violet	Viola sororia	1971
New Mexico	Tree	pinyon	Pinus edulis	1949
	Flower	yucca	Yucca glauca	1927
New York	Tree	sugar maple	Acer saccharum	1956
	Flower	rose	Rosa	1955
North Carolina	Tree l	ongleaf pine	Pinus palustris	1963
	Flower	American dogwood	Cornus florida	1941

North Dakota	Tree	American elm	Ulmus americana	1947
	Flower	wild prairie rose	Rosa arkansana	1907
Northern Marianas	Tree	flame tree	Delonix regia	
	Flower	plumeria	Plumeria rubra forma acutifolia	
Ohio	Tree	buckeye	Aesculus glabra	1953
	Flower	scarlet carnation	Dianthus caryophyllus	1904
Oklahoma	Tree	redbud	Cercis canadensis	1937
	Flower	mistletoe	Phoradendron leucarpum	1893
Oregon	Tree	Douglas fir	Pseudotsuga menziesii	1939
	Flower	Oregon grape	Mahonia aquifolium	1899
Pennsylvania	Tree	eastern hemlock	Tsuga canadensis	1931
	Flower	mountain laurel	Kalmia latifolia	1933
Puerto Rico	Tree	silk-cotton tree	Ceiba pentandra	
	Flower	puerto rico hibiscus	Montezuma speciosissima	
Rhode Island	Tree	red maple	Acer rubrum	1964
	Flower	violet	Viola palmata	1968
South Carolina	Tree	palmetto	Sabal palmetto	1939
	Flower	yellow jessamine	Gelsemium sempervirens	1924
South Dakota	Tree	Black Hills spruce	Picea glauca	1947
	Flower	pasque flower	Anemone patens var. multifida	1903
Tennessee	Tree	tulip poplar	Liriodendron tulipifera	1947
	Flower	iris	Iris germanica	1933
Texas	Tree	pecan	Carya illinoinensis	1947
	Flower	Texas bluebonnet	Lupinus spp.	1901
Utah	Tree	blue spruce	Picea pungens	1933
	Flower	sego lily	Calochortus	1911
Vermont	Tree	sugar maple	Acer saccharum	1949
	Flower	red clover	Trifolium pratense	1895
Virginia	Tree	flowering dogwood	Cornus florida	1956
	Flower	flowering dogwood	Cornus florida	1918
Washington	Tree	western hemlock	Tsuga heterophylla	1947
	Flower	coast rhododendron	Rhododendron macrophyllum	1892
West Virginia	Tree	sugar maple	Acer saccharum	1949
	Flower	rhododendron	Rhododendron maximum	1903
Wisconsin	Tree	sugar maple	Acer saccharum	1949
	Flower	wood violet	Viola sororia	1949
Wyoming	Tree	plains cottonwood	Poplus deltoides subsp. monilifera	1947
	Flower	Indian paintbrush	Castilleja linariifolia	1917

* California has designated two distinct species as its state tree.

** Although Iowa did not designate a specific species of oak as its state tree, many people recognize bur oak, Quercus macrocarpa, as the state tree since it is the most widespread species in the state.

*** Although no specific species of magnolia was designated as the state tree of Mississippi, most references recognize the Southern Magnolia, Magnolia grandiflora, as the state tree.

**** In Illinois, Missouri, and Texas, multiple species fit the legislated name of the state flower.

Last Updated June 25, 2004 11:22 AM

URL = http://www.usna.usda.gov/Gardens/collections/statetreeflower.html

State Trees and Flowers

Name ______________________________

Every state in the United States has an official tree and flower.

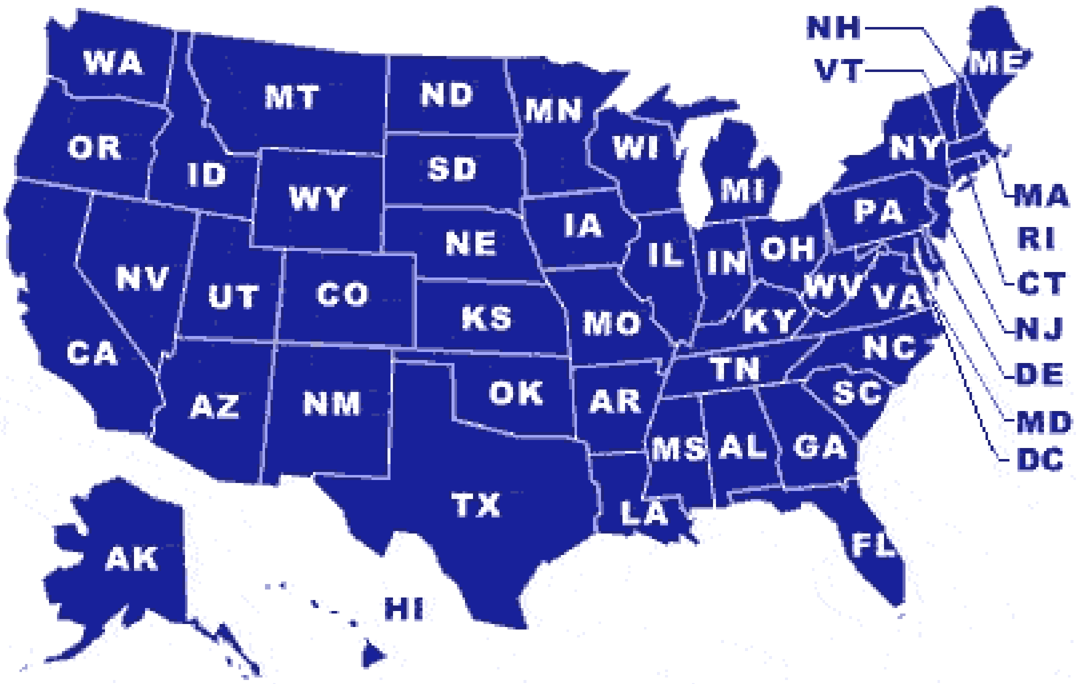
The state I live in is ___________________________.

<table>
<tr><td colspan="2">My state's tree is the ______________________________.</td></tr>
<tr><td>This is what it looks like:</td><td>Here are some things I know about this tree.
____
____
____
____
____
____
____
_______________________</td></tr>
<tr><td colspan="2">My state's flower is the _____________________________.</td></tr>
</table>

What is Your State's Tree?

Name ______________________________ Date ______________________

Every state in the United States has adopted a tree. What is your stat's tree? Do you know what it looks like? Find your state and circle it. Draw your state tree in the frame below.



The name of my state is:

____

My state tree is:

____

Math Activities

Tallying and graphing
Have students walk around home, school, or community and tally, then graph types of trees classifying them by coniferous vs. deciduous or by venation pattern of leaves or by leaf margins (smooth/serrated/lobed). See accompanying sheets for tallying and graphing types of trees by leaf patterns.

Measuring with Non-standard units
Have students choose an object or body part such as a hand span, and use it to measure the distance around various trees or the height of plants and shrubs.

Measuring the height of a tree

Finding the diameter of a tree using its circumference

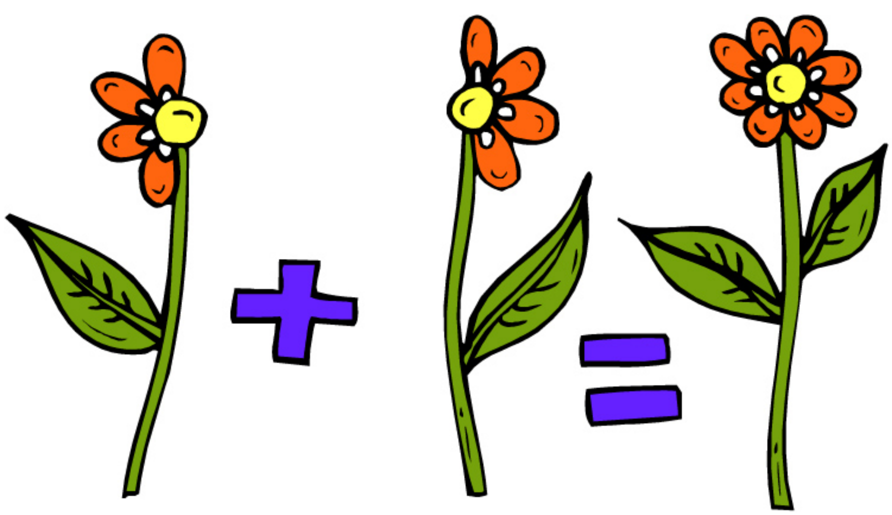
Surface area of a Leaf (Grades 7-9)

http://www.pbs.org/teachersource/mathline/concepts/plants/activity3.shtm

Quadratic growth
Through the process called photosynthesis, plants absorb light through their leaves and use it to split water molecules into hydrogen and oxygen molecules. The oxygen is released into the atmosphere and the hydrogen is combined with carbon dioxide from the atmosphere to create sugar to feed the plant.

Constant or linear plant growth (Grade levels: 3-6)

http://www.pbs.org/teachersource/mathline/concepts/plants/activity1.shtm



Plant Record Breakers

Use the following facts to challenge students' math skills. Have them convert English units to metric or vice versa, find the differences between the sizes or weights of two items, compute how many of one item it would take to equal another, how many packs of pumpkin seeds could the prize winner buy with his/her winnings, and so on.

The bristlecone pine is believed to be 5,000 years old. What biblical events were taking place when it first germinated?

Before the age of the bristlecone pine was discovered, it was believed that the giant sequoia was the oldest living thing. By counting the rings on a cut stump, it was estimated to be 3, 200 years old. In addition, it is certainly the world's most massive living thing. The largest tree is named General Sherman and is 272 feet tall with a trunk that is 35 feet in diameter and 109 feet in circumference at the base. It is estimated to contain 600,000 board feet of lumber which is enough to build 120 average size houses.

The world's tallest tree is another conifer native to California, the coast redwood. The record stands at 367 feet (112 meters) which is 62 feet (19 meters) taller than the Statue of Liberty.

The seed of a date palm was discovered during an archeological excavation at King Herod's Palace near the Dead Sea. The palm that sprouted from this ancient seed is believed to be 2,000 years old. Another amazing seed was that of an Asian water lotus that germinated after 1,200 years. The trunk weighs nearly 1,400 tons. This is about as much as 15 adult blue whales or 25 military battle tanks.

Date-Tree Canary
(Phoenix Canariensis)

The world's smallest flowering plant, the wolffia plant, is shaped like a microscopic green football with a flat top. An average plant is small enough to pass through the eye of a needle and 5,000 could fit into a thimble. The plant on average is 0.5 millimeters long (1/42 of an inch) and 0.3 millimeters wide (1/85 of an inch). It weighs about 150 micrograms (1/190,000 of an ounce) or about as much as two to three grains of table salt.

In 1996, a record breaking pumpkin weighed in at 1,061 pounds. Its owners received a grand prize of $50,000. In 2002, a pumpkin was grown in Manchester, N.H. which outweighed the previous winner considerably. It weighed 1,337 pounds.

The world's largest seed comes from the coco-de-mer palm native to the Seychelles Archipelago in the Indian Ocean. Although it belongs to a different genus from true coconut palms (**Cocos**), this enormous seed is often called the "double coconut." A single seed may be 12 inches (30 centimeters) long, nearly three feet (0.9 meters) in circumference and weigh 40 pounds (18 kilograms).

Coconuts are actually seed of the coconut tree. Some have been know to float along rivers or oceans for as far as 1,200 miles. If a coconut could float that far from your school, where might it land?

Name ________________

Date ________________

Illustration of basic leaf patterns:

simple

compound

Graph of Leaves

Simple	Compound

Name _______________

Date _______________

Illustration of Leaf Types

smooth

serrated

lobed

Graph of Leaves by Margin Type

smooth	serrated	lobed

Name ___________________

Date ____________________

Illustration of Leaf Types

Parallel

Palmate

Pinnate

Graph of Leaves by Vein Pattern

Parallel	Palmate	Pinnate

Name ________________________

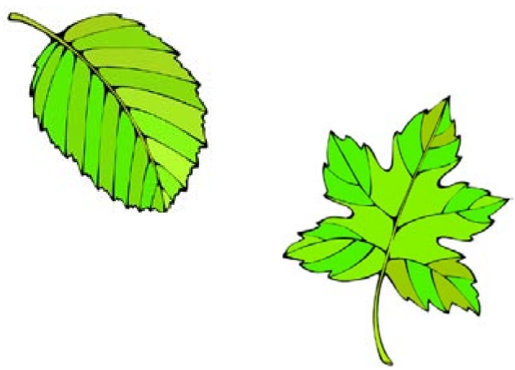
Tallying Sheet for Leaf Types

Simple		**Smooth**		**Parallel**	
Compound		**Serrated**		**Palmate**	
		Lobed		**Pinnate**	

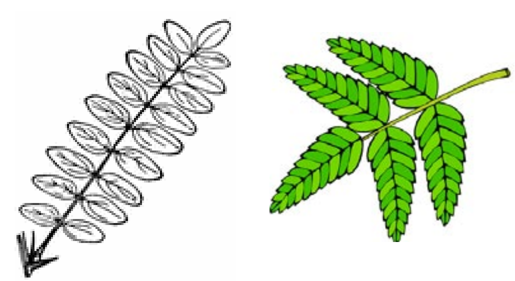
Name ______________________________

Tally Sheet for Leaf Types
(simple vs. compound)

Simple						
Compound						



Simple Leaves



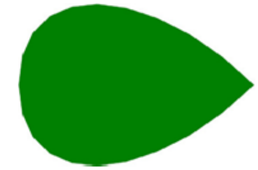
Compound Leaveds

Note to teacher: In order to help young students keep tally marks neatly organized, it is intended that one group of five tally marks will be placed in each box. Tally sheets are provided for several different methods of classifying. Young children should be asked to use one method rather than three.

Name ______________________________

Serrated
Edges are teath-like

Lobed
edges are cut out



Entire
smooth edge

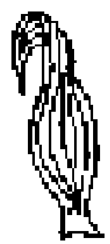
Tally Sheet for Types of Leaves
(by margin pattern)

Smooth						
Serrated						
Lobed						

Note to teacher: In order to help young students keep tally marks neatly organized, it is intended that one group of five tally marks will be placed in each box. Tally sheets are provided for several different methods of classifying. Young children should be asked to use one method rather than three.

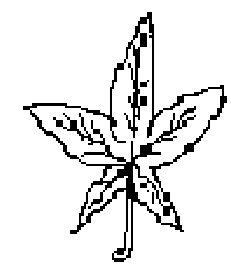
Name ______________________________

Parallel-veined



Pinnate

Palmate



Tally Sheet for Types of Leaves
(by vein pattern)

Parallel						
Palmate						
Pinnate						

Note to teacher: In order to help young students keep tally marks neatly organized, it is intended that one group of five tally marks will be placed in each box. Tally sheets are provided for several different methods of classifying. Young children should be asked to use one method rather than three.

I Work for Peanuts

Objectives:
Students will:
* estimate and then revise their estimates to create a more accurate assessment of the number of peanuts in a jar.
* research peanut facts on the Internet.

Materials needed:
* student activity sheet
* computer with Internet access
* large jar of peanuts
* cups

Web sites:
http://www.peanut-shellers.org/Facts/facts.html
http://www.vadiner.com/facts.html

Teaching the lesson:
Use a large Mason jar or goldfish bowl for your peanuts. Use shelled nuts. Use this as an opportunity to discuss how one can estimate and revise estimates based on closer observation and research on a topic. Be sure you know how many peanuts are in the jar beforehand!

I Work for Peanuts

Name ________________________________ **Date** ____________________

Your teacher has a large jar full of peanuts. Everyone will have a chance to look carefully at the jar. After you have taken your first look, write down your estimate of the number of peanuts in the jar.

First estimate _________________

Now your teacher will give you a peanut. Examine it carefully. Are you certain of your first estimate? You may write a new estimate for the number of peanuts in the jar if you wish.

Second estimate _______________

Go to:

http://www.peanut-shellers.org/Facts/facts.html

http://www.vadiner.com/facts.html

Write down two facts you did not know about peanuts.

1. ____

2. ____

Your teacher will now give you a cup full of peanuts. Examine it carefully. Count the peanuts in the cup. Write this number down.

Peanuts in the cup ______________

You may now revise (change) your estimate of the number of peanuts in the jar one last time.

Third estimate of peanuts in the whole jar ____________________

Your teacher will now reveal the actual number of peanuts in the jar. Write down this number.

Actual number of peanuts in the jar _______________

What is the difference between your last estimate and the actual number in the jar? ___

Your first estimate? ____________

Larry's Lawn Service

Name ________________________________ Date ____________________

Larry needs to hire five teenagers to help him with his lawn service this summer. He has decided to hire Jay, Luke, Nick, Christi and Aimee. Now he is trying to place them in appropriate positions. Using the information from the job applications and Larry's personal preferences, can you help him match the right person to the right job? He needs one teenager to drive the truck carrying his equipment, one to mow lawns, one to trim shrubbery, one to apply fertilizer and weed killer, and one to do office work.

1. Nick is too young to have a driver's license or handle chemicals.
2. Aimee has both typing and driving experience.
3. Luke is allergic to all types of plants.
4. Jay has experience in all areas of grass care.
5. Christi enjoys shaping bushes.
6. Larry prefers to have a male in the office.

Use this box to help you sort out the information. Put an X in the boxes that can't be true and an O in the boxes that might be true. Write your final answers in the blanks at the bottom of the page.

	Drive	Mow	Trim	Fertilize	Office
Jay					
Luke					
Nick					
Christi					
Aimee					

Jay ________________ Luke ________________ Nick ________________

Christi ____________________ Aimee ____________________

Larry's Lawn Service

Name KEY Date ____________

Larry needs to hire five teenagers to help him with his lawn service this summer. He has decided to hire Jay, Luke, Nick, Christi, and Aimee. Now he is trying to place them in appropriate positions. Using the information from the job applications and Larry's personal preferences, can you help him match the right person to the right job? He needs one teenager to drive the truck carrying his equipment, one to mow lawns, one to trim shrubbery, one to apply fertilizer and weed killer, and one to do office work.

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Use this box to help you sort out the information. Put an X in the boxes that can't be true and an O in the boxes that might be true. Write your final answers in the blanks at the bottom of the page.

	Drive	Mow	Trim	Fertilize	Office
Jay					
Luke					
Nick					
Christi					
Aimee					

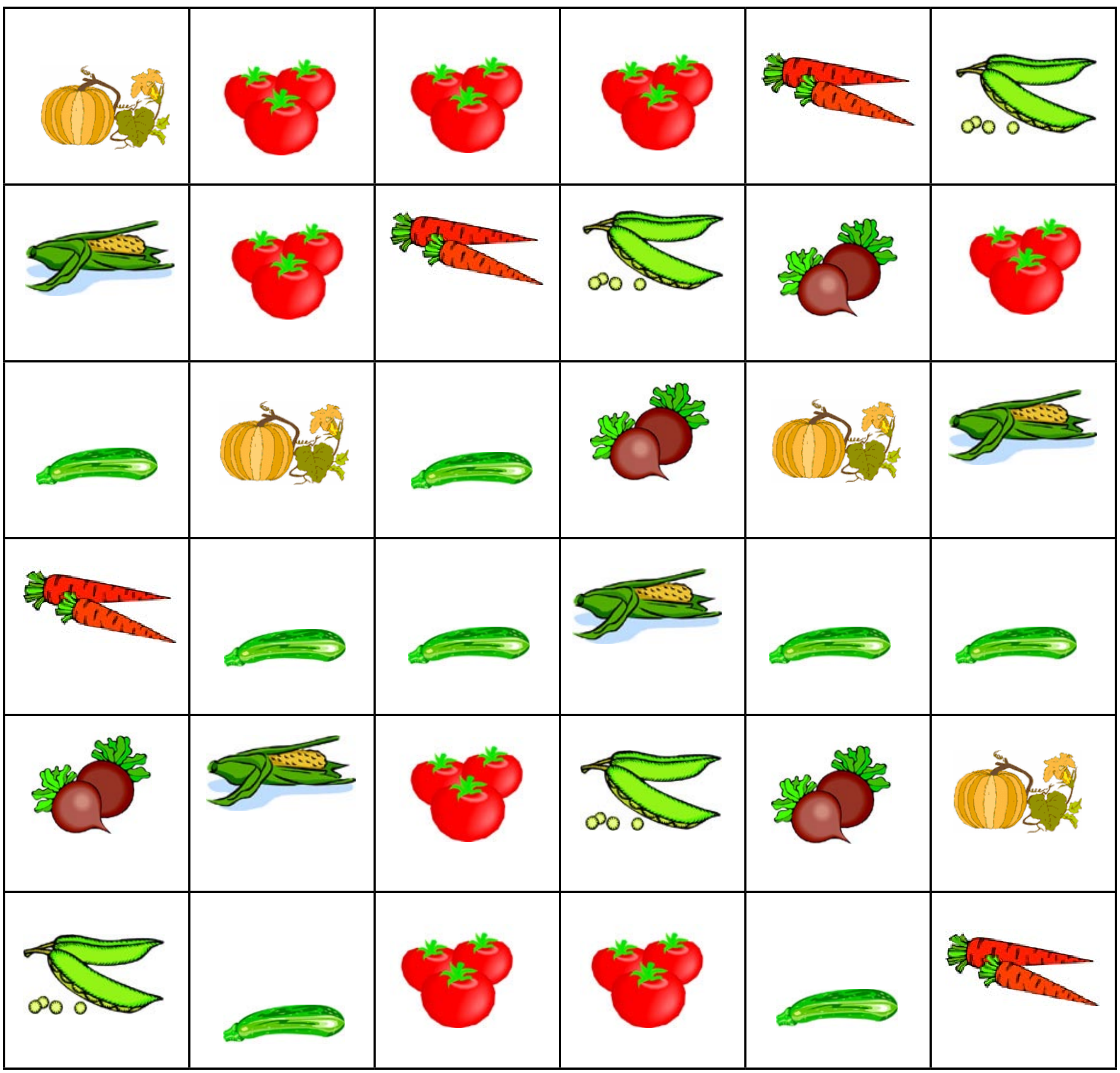
Jay fertilizer/weed killer **Luke** office **Nick** mow

Christi trim shrubs **Aimee** drive

Garden Grief

Name ______________________________ Date __________________________

Mr. and Mrs. Planter have asked their children to plant the family garden this spring. The four kids, Teri, Gary, Mary and Hary, have devised the unusual plot and planting scheme shown below. Now the kids are trying to divide this garden into four portions, one for each of them to plant and weed. Can you help them? Each child's portion must contain the same amount of the same types of vegetables, and each child's portion must be connected in one piece. Draw your dividing lines in this garden.



Garden Grief

Name KEY Date ______________

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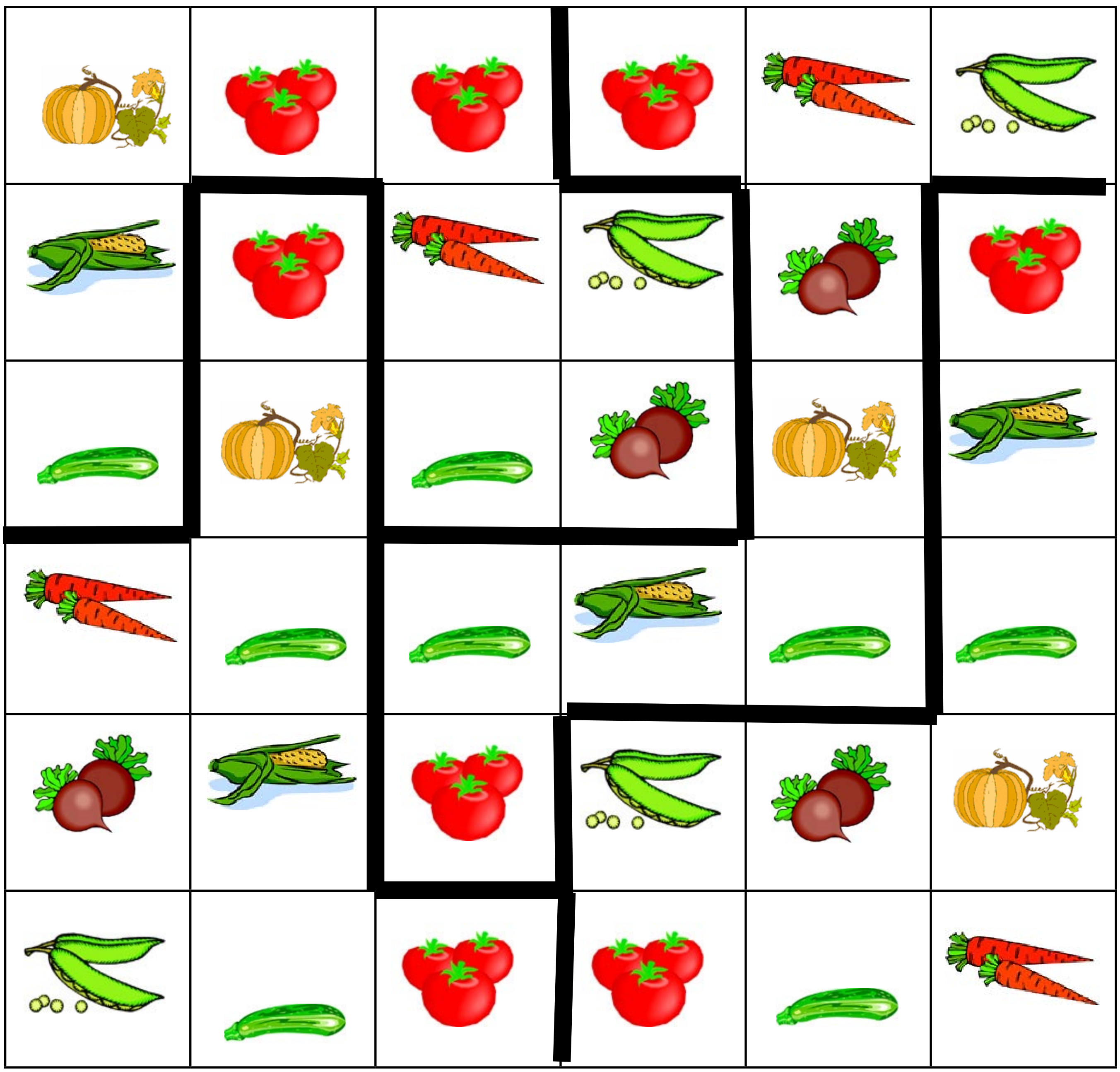


Leaf Prints

The beauty of leaves can be preserved in several ways described below:

<u>Spatter prints</u>

1. Place newspaper on the work surface. Have students wear paint smocks.
2. Place white paper on top of the newspaper and use tacks to hold a leaf (or grass seed or flower seed heads) in the place on the paper.
3. Dip an old toothbrush in paint. Scrape a craft stick across the brush so that the splatters form a print around the leaf.
4. Remove the leaf to reveal an outline of the leaf.

<u>Wax pressing</u>

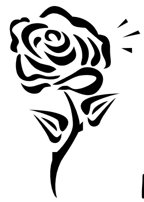
1. Cover the work surface with cardboard. Heat an iron (for teacher use only).
2. Cut two pieces of wax paper the same size. Place a leaf and/or flowers between the two sheets of wax paper. Add some glitter or crayon shavings if desired.
3. Cover the wax paper “sandwich” with a rag. Iron slowly over the entire area to melt the wax paper, sealing in the leaves.
4. Remove the rag and put the project on a flat surface to cool. Add ribbon or rickrack around the edge or trim it to give it a finished appearance.

<u>Gilded leaf pictures</u>

1. Choose visually-appealing leaves and place them between the pages of a book to flatten and dry for several weeks.
2. Arrange the dried leaves on a sheet of paper and them in place.
3. If desired, cover the leaves with a layer of black paint. When the black paint is dry, give the leaves an antique look by sponging gold paint over them. Do not cover the whole leaf with gold paint, leave it patchy.
4. Frame the picture.

<u>Leaf rubbings</u>

Place a leaf on a work surface and cover it with a sheet of paper. Using the side of a crayon, rub over the leaf to reveal its shape. Move the leaf and repeat to form an interesting pattern.



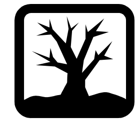
Plant Craft Projects

Perfumed rose water
1. Fill a saucepan with rose petals (strongly scented red roses are best) and cover with water.
2. Bring the water to a boil and simmer (adult supervision required).
3. Remove the pan from the heat, cover and allow to cool.
4. Strain the rose water into jars with lids (baby food jars would work).
5. Glue fabric circles to the lids and tie them around the jars with ribbon.
6. Make and decorate a label that says "Rose Water".

Sweet smelling sachet
Materials: fresh spices (cinnamon sticks, ginger, whole cloves, anise), flower petals, other tiny treasures found in nature (small pine cones, twigs, dry leaves), mixing bowl, mortar and pestle or wooden meat mallet or hammer, cheesecloth cut into 8" circles, ribbon.
1. Set aside some of the whole spices and crush the rest.
2. In the mixing bowl mix all of the ingredients.
3. Place small amounts of the mixture in the center of the cheesecloth and roll to make a log-shaped potpourri sachet.
4. Tie a ribbon around the sachet at both ends. They may be used to scent a drawer or closet.

Paper weight
Materials: dried flowers cut from their stems, heavy glass ashtray (available at restaurant supply stores) or baby food jars, colored posterboard, pencil, scissors, wax paper, white glue.
1. If using the ashtray place it upside down over the posterboard and trace around it. Cut out the shape making sure that it fits exactly over the ashtray.
2. Spread wax paper over the work area. Place the posterboard cutout on the wax paper. Glue an arrangement of dried flowers in the center of the posterboard allowing the glue to dry.
3. Spread a thick bead of glue around the edges of the posterboard and press the ashtray upside down onto the glue forming a dome over the flowers. Allow to dry.

Four seasons tree



Materials: thin tree branches or twigs, construction paper, scissors, markers or colored pencils, lightweight string or tape, vase or flower pot

1. Find four branches of similar size with several twigs coming off them.

2. Decorate each branch to represent one of the seasons (cut snowflakes, flowers, bugs, leaves, apples, etc. out of construction paper. Color them appropriately and tie or tape them onto the branches. Arrange them in a vase or pot (fill the pot with sand or rice if needed to stabilize it).
Adapted from **365 Art and Craft Ideas** by Rita Hoppert.

Flower-making fun

Materials: scissors, construction paper, pipe cleaners, tape, colored tissue paper, foam egg carton, vase, potpourri (optional)

To make a lily, cut an ice cream cone shape from a piece of construction paper. Overlap the sides of paper together around a pipe cleaner stem. Tape the sides to hold it in place. Bend the top of the pipe cleaner in a small hook to form the stamen.

To make a rose, cut three concentric circles from tissue paper. Place them on top of each other and poke a hole in the center. Insert the pipe cleaner through the center and twist the bottom of the circles. Secure with a piece of tape.

To make a tulip, cut one cup from an empty egg carton. Trim the edges in the shape of a tulip. Poke a small hole in the center of the cup, and insert a pipe cleaner stem. To transform a tulip into a daffodil, make the tulip and add a circle of tissue paper around the bottom of the cup.

Arrange all the flowers in a vase and add potpourri for fragrance if desired.

Taken from **365 Art and Craft Activities** by Rita Hoppert

Grow a Head of Hair

Materials:

Panty hose cut into one-foot "tubes"
grass seed
small rubber band
wiggle eyes
black and red fabric paint
sawdust
plastic bowl
pipe cleaners
hot glue gun
water

Procedure:

Take one panty hose "tube" and at one end tie a small knot, and turn it inside out. Take a small handful of grass seed and shake it to the bottom where the knot is. Next, stuff sawdust in the tube, packing the "head" as you go. When the head is the size that you want take a small rubber band and tie up the neck or tightly tie the panty hose where the neck would be. Shape the head with your hands and pull out a section for the nose. Tie the nose with a small rubber band and shape it. Pull a section on both sides out where the ear should be and place a rubber band on each side to form the ears. Hot glue wiggle eyes where his eyes should be. Use fabric paint to paint the features—red for the mouth, black for the eyelashes, mustache, glasses, eyebrows, etc. When the paint has dried, set "Mr. Hair" in a plastic bowl filled with water, making sure he is saturated for a day. Then stand him up in the bowl and within a few weeks, he will have a head of hair. Make sure that the tail of the panty hose acts as a wick into the water so that the water is drawn up into the head. You can trim the hair as it grows if desired.

INTRODUCTION:

Elementary students create individual projects by viewing Van Gogh, Matisse, and Eric Carle examples. Each grade completes a garden painting using various techniques and media while learning about artists, insects and flowers. Projects are mixed media incorporating different art techniques. Guide students in critiquing theirs' and others' artwork. When complete, display projects in cafeteria or hallway. All projects can be integrated with Science, Reading, Writing, and Computer Skills.

Kindergarten (Pictures)

Material:

- Large white construction paper
- Colored tissue paper (cut into stem, flower, leaf, and petal shapes)
- Vinegar
- Sliver glitter
- Spring-type clothespins (1 per student)
- Pipe cleaners
- Wiggle eyes
- Food coloring
- Coffee filters

1.

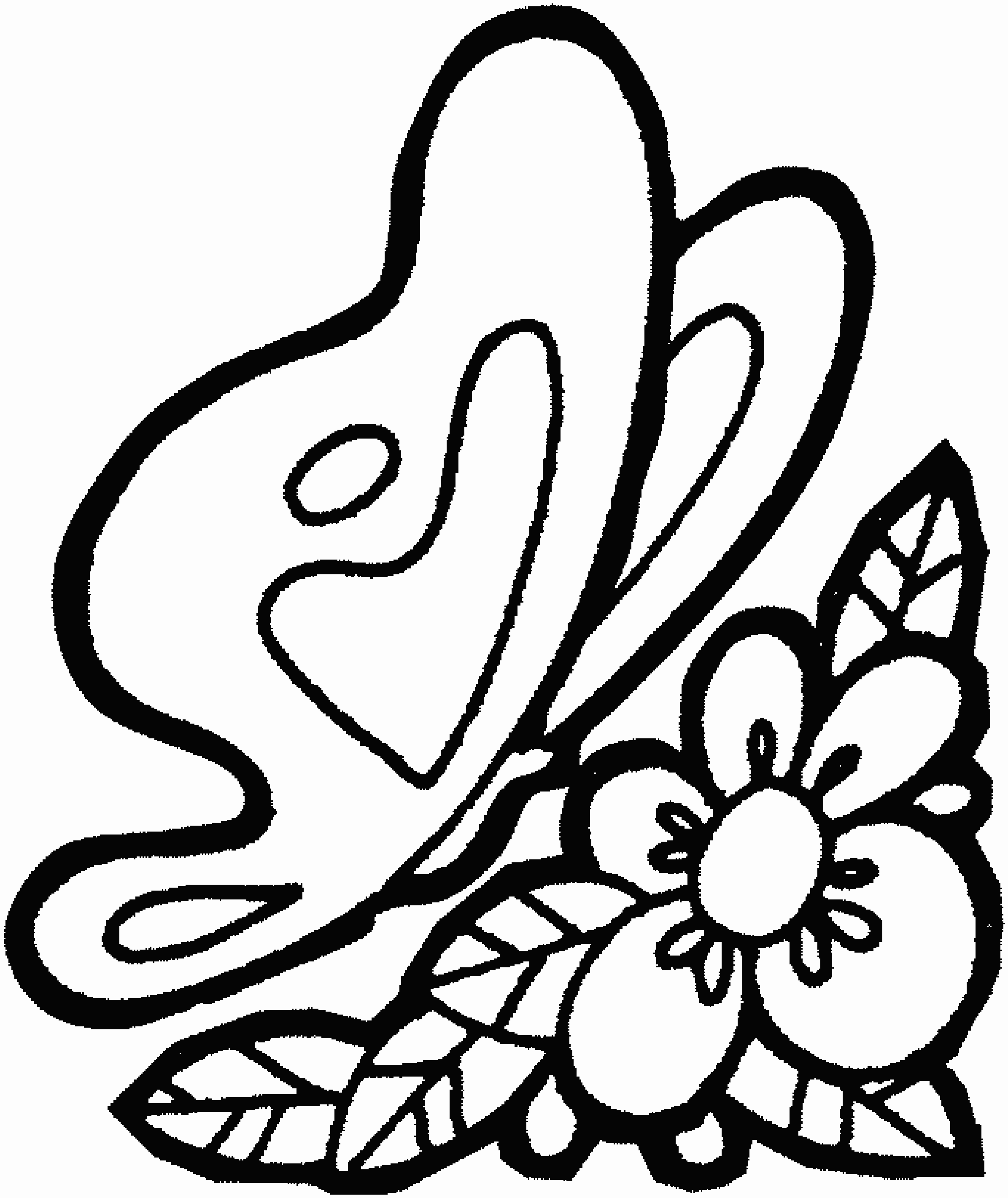
Begin by looking at Eric Carle's book **The Tiny Seed**. Discuss and explain how Carle made the illustrations in the book. This technique is called collage. Choose two examples from the book and explain in detail how each shape was cut and then pasted to create that picture. Matisse examples can be used too.

2.

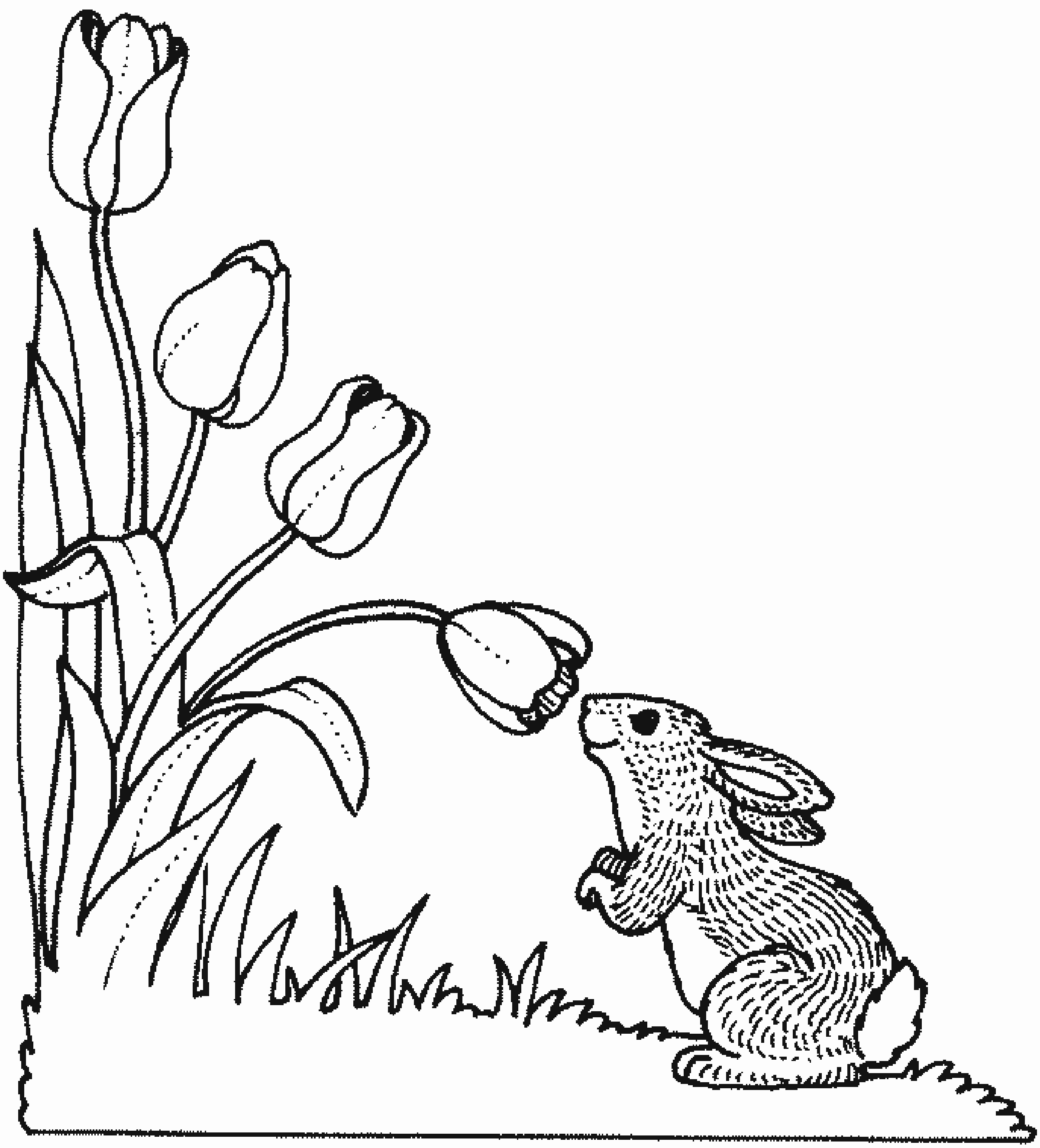
Pass out white construction paper and tissue paper shapes. Demonstrate how to lay out green stem and leaf shapes. If round yellow sun shapes have been cut, lay the sun shape on the paper too. Hold the end of one of the shapes with one finger and paint over it with vinegar. This will cause the dye from the tissue paper to stain the white paper. While students are painting, dying objects (such as Easter eggs) can be discussed. When the green stems, leaves and sun are dry; flower and petal shapes can be painted on.

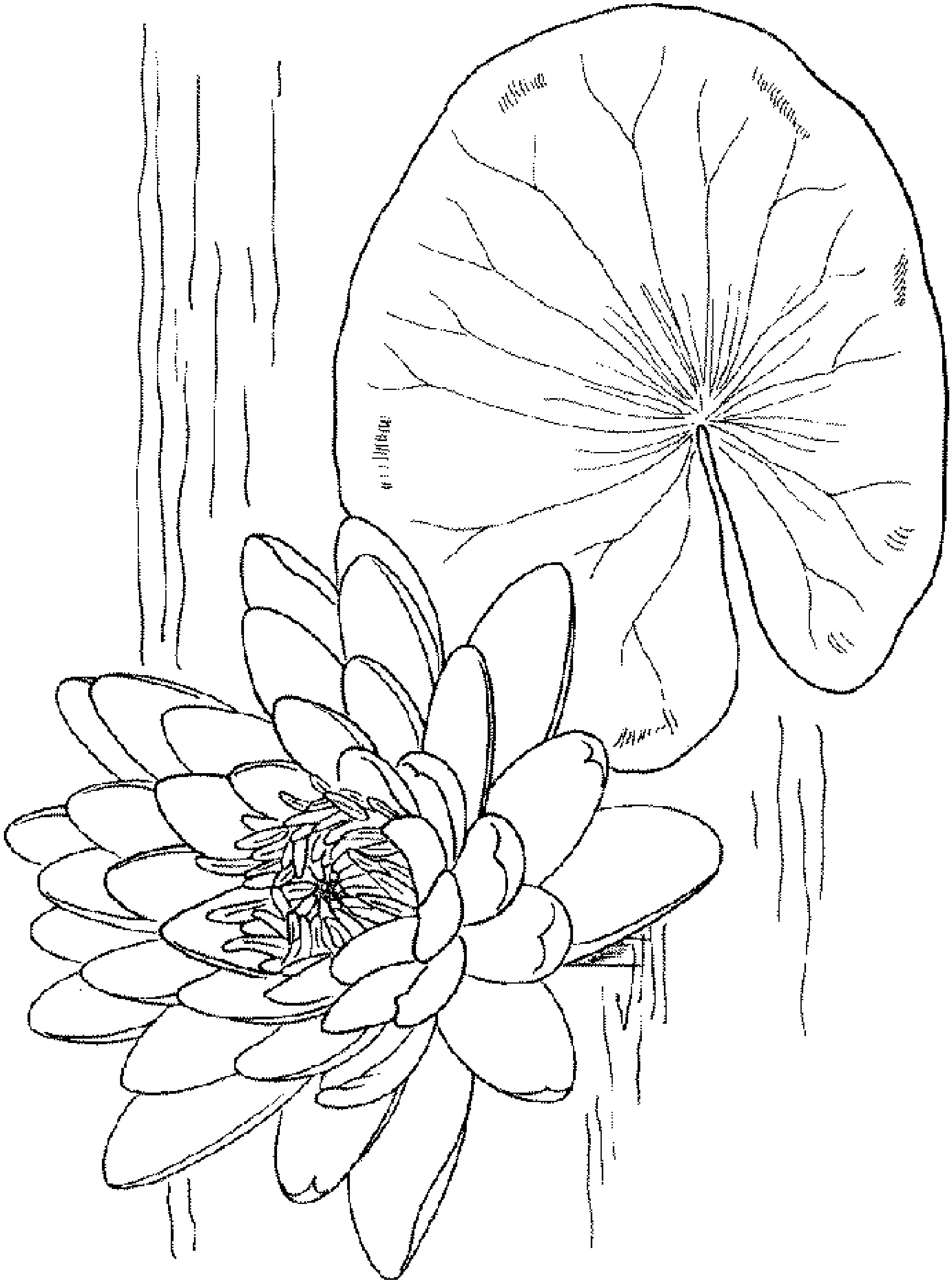
3.

Mount painting on colored paper to create a boarder and read **The Tiny Seed**.



Mary, Mary quite contrary,
How does your garden grow?
Silver bells and cockle-shells,
And pretty maids all of a row.



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www.primeraescuela.com

Plant-Related Songs

Happy Songs for Boys and Girls (old green primary book everyone has!)
Beautiful Flowers p. 71
Kind Hearts are the Gardens p. 78
God Made the Lilies p. 120

SDA Hymnal
All Things Bright and Beautiful # 93
In the Garden # 487

Sing for Joy (current yellow primary book)
Joyful, Joyful, We Adore Thee #1
Sing Praises to the Lord #2
All Things Bright and Beautiful #51
Think of a World Without any Flowers #60

Technology Activities and Web Sites

Activities:

Have students document phases of experiments using a digital camera. Pictures could be printed or incorporated in a PowerPoint slide show presentation.

Students could collect data on various plant-related projects and use the data to make graphs on the computer.

Older students could complete a webquest (see the National Gardening Web site below)

Using Kidpix or other drawing program, have students draw and label the parts of a plant or various classifications of leaves, etc.

Using Kidpix or other drawing program, have students create an ABC slide show about flowers or trees.

Use the Kidpix slide show to build classroom vocabulary. Assign a student a vocabulary word which they type, define and illustrate, adding to those other students have done on the topic of plants. Alternatively, use a word-processing program to create a dictionary. Set up a three-column table, with the first column for the word, the second column for the definition and the third for an illustration which could use clip art or be printed for hand-drawn pictures.

WEB SITES:
The Great Plant Escape Game
http://www.themeunits.com/April_bk.html
An interesting site which teaches or reviews concepts about plants and provides a question/answer type game; interesting graphics and it is a free site.
National Gardening
http://www.kidsgardening.com/teachers.asp
An exhaustive site with materials for both teachers and kids, and links to ready made webquests; offers tremendous ideas for community service projects that integrate academic learning with the real world. Check it out!

America the Beautiful Fund
www.america-the-beautiful.org
A national recognition program for planting projects; gives away free seed packets—must pay shipping.

http://www.clyderobin.com/company/request.html.
Clyde Robin Seed Company catalog contains information and pictures about seeds and various types of flowers. It can be obtained by writing Clyde Robin Seed Company, P.O. Box 2366, Castro Valley, CA 94546-0366 or by e-mail from the Web site above.

http://www.sci.mus.mn.us/sln/tf/d/dandelion/dandelion.html
A wonderful site with pictures and information about dandelions.

http://www.h2olily.com
For information about flowers that grow in the water (water lilies), check out this site. There are lots of pictures and two live cameras to view the pond.

http://www-personal.umich.edu/~agrxray/
The Secret Garden: This site contains radiographs of flowers. The radiographs look like x-rays taken of the flowers.

http://urbangarden.com/index.html
URBAN Garden: Pictures and stories of flowers planted in an urban garden.

http://www.florida.com/cypressgardens/index.htm
Welcome to Cypress Gardens: This is an information page about Cypress Gardens, located in Florida. There are beautiful pictures of the flowers you should expect to see on a visit.

www.primarygames.com
Many free games and activities; lots of ads; some slightly objectionable activities—use your discretion.

http://www.bbc.co.uk/schools/scienceclips/ages/6_7/plants_animals_env.shtml
A game for K-2 which corresponds nicely to the lesson plan for Day 2.

http://www.quia.com/cc/99.html
A plant parts concentration game appropriate for grades 2 and up.

www.jeancraigheadgeorge.com
This is a website by the author of My Side of the Mountain. Contains brief movie clips of her talking about the settings of some of her books, writing prompts, and a question and answer page.

<u>Fall Leaves Change Colors</u>
By Kathleen Weidner Zoehfeld

Daily Lesson Guide for Grades 1-2
By Kim Kaiser

Introduction

Synopsis

Fall Leaves Change Colors is a non-fiction book which provides a basic explanation of the processes which cause leaves to change color in the fall. Rich photographs illustrate the book and the concepts taught. Inserts provide a close-up look at parts of trees. It ties in nicely with a thematic study on plants and trees.

SKILLS OVERVIEW

The following skills are covered in this unit. An * indicates that the skills are to be assessed.

Target 1, Extended Reading and writing

In addition to reading and writing activities in this unit, additional time will need to be set aside for reading and writing workshops as well as guided reading lessons.

Target 2, Comprehending, _______________

Write titles for their own and other's writing
Pose questions about reading, provide answers and proof from text
Analyze and compare using Venn diagrams

WRITING FORMATS

Sentences, journal entries, questions, comparisons

Phonics Phones are jointed pieces of PVC pipe which a student may place between his ear and mouth like a phone. They allow students to more accurately hear the sounds they are making as they speak or read and can help reduce classroom noise. More importantly, they are fun. Commercially made products are available free to teachers in limited quantities and more may be ordered for a nominal fee. (http://www.crystalspringsbooks.com/prodinfo.asp?number=6316)

BIBLICAL/SPIRITUAL CONNECTIONS:

Albeit marred by sin, God has provided us with a wonderfully beautiful world which continues to reveal His great creativity and love for us. Students should know on which day of the creation week plants and trees were made. They will be asked to imagine and depict their concept of the tree of life in heaven and to compare/contrast the life cycle of trees in heaven with those of deciduous trees here.

SUGGESTED LITERACY CENTERS

Reading:

- Print poems suggested for use in lesson plans on sentence strips, one line per strip. Mix strips up and have students reassemble the poem once they have become familiar with it.

- With student help, create a memory game. Write vocabulary words on index cards and ask students to illustrate the words on a separate index card. Teach students to play the game by turning over two cards looking for a match between the vocabulary word and the picture. If a match is obtained, the student says the vocabulary word and may turn over two additional cards. If not, it is the next person's turn. The person with the most cards at the end of the game wins. De-emphasize the competitive aspect of the game.

- Write sentences containing vocabulary words on sentence strip, each sentence on a different color. Laminate and cut the sentence strips apart in words. Mix the words together and have students reconstruct the sentences.

- Check targeted first grade patterns- Using magnetic letters on a metal surface, have students form nouns ending in "f" then replace the "f" with "ves" to form the plural of the word. (leaf, wife, knife, life, thief, sheaf)

ASSESSMENT

Strategy Instruction: Always focus on reading strategies so that children gain in confidence to figure out words for themselves. It is important to remember that readers need opportunities to correct their own errors so that they may use strategies essential for independence. "Wait time" and coaching are critical to the child's independent use of strategies.

Prompts:

a. How can you figure this word out yourself? You almost got it.
b. Reread the sentence. What do you think makes sense in the sentence? Does that sound right?
c. Look at the first letter. Use that first letter to help you. Now check to see if the last sound matches your guess.
d. Do you know another word that has the same pattern? (Refer students to the word wall.)

After the child has figured out the word, focus on how she went about succeeding. Discussion about strategies will help readers become more aware of what to do the next time they encounter a word they don't know.

Prep:
Copy poem and Revelation 22:1,2 onto chart paper, write vocabulary words at the top of 5x7 index cards; additional 5x7 cards with an empty box at the top in which you will add other vocabulary words as students think of them; duplex copy blackline master 1 for each student; prepare folders to keep student work in (one per student; perhaps construction paper folded in half); copy of poem for each student (may be laminated for reuse); copies of blackline master 2 (may be laminated for reuse); Supplemental materials: leaf poem written on sentence strips, one line per strip, copies of poems for students to illustrate and add to their collections.

Session 1
Pre-reading:
Read **Autumn Leaves** poem to students. Ask them what "brain pictures" it made them think of. Reread the poem, sweeping hand or pointer under words as you read.

Vocabulary:
Gather the class close to you in a circle. Introduce the following vocabulary words on 5X7 index cards, leaving room for students to illustrate the words in a later session: **autumn, chlorophyll, carbon dioxide, tannin.** Ask students if they know what the words mean and provide explanations for any unknown words. Assist students to construct a sentence which incorporates each word and write the sentence on a sentence strip, thinking out loud with regard to capitalization and punctuation. Have students reread the sentences in chorus. Add the word cards and sentence strips to the thematic bulletin board or word wall. If sentences contain words which feature the phonics elements for the week, draw attention to those.

Session 2
Pre-reading:
Reread **Autumn Leaves,** having one of students point to words as you read.

Vocabulary:
Present students with cards from session 1's vocabulary activity. Ask students if they remember what each word means. Ask for student volunteers who would like to illustrate each card and provide them with time to do so later.

Reading:
Show the cover of the book **Fall Leaves Change Colors**. Ask students if they remember the scientific name for a tree that loses its leaves (deciduous). Have them think of a time when they played in fall leaves then turn to a partner and share the experience they thought of. Do a picture walk through the book pausing at interesting pictures to ask individual students "what are you thinking?" Instruct students to listen for the new vocabulary words as you read and to make a hand gesture like falling leaves when they hear one of the words. Read the book.

Comprehension:
Give students a copy of the blackline master 1 which contains boxes labeled with the four seasons. Explain that it will be their job to draw and illustrate, in the autumn box, an autumn tree before all the leaves have fallen. Explain that you will be asking them to evaluate their work when they are done and that you will be looking for three things: is the tree in the correct box (1 point), are the colors real (0-3 points), and did I do my personal best (2 points). Further explain that when they have finished the whole paper they will be asked to evaluate with regard to keeping the paper neat, clean and free of wrinkles. Remind those who volunteered to illustrate the vocabulary cards to do so when they finish their tree picture. When calling students for guided reading groups (or at some other convenient time) have them bring their fall tree pictures so that you can help them self-evaluate.

Writing: Journal
Suggest that students may want to draw a picture and write in their journals about a time when they played in fall leaves. Share a story of your own about such a time if possible.

Session 3

Pre-reading:
Reread the poem **Autumn Leaves,** pausing to allow students to supply the second of the pair of rhyming words.

Vocabulary:
Cover the word on each vocabulary card with a sticky note. Have students who illustrated vocabulary cards show them to the group and ask the group to guess the word which was illustrated. Uncover the word to reveal whether they were correct or not.

Reading:
Explain that today you will be rereading the book. But this time, as you do, you want students to try to make up a question that can be answered by what you have read. As an example, read page 8 and explain that a question you can make up from that page would be "What is the green coloring in leaves called?" (Allow students to answer "chlorophyll" and then ask them to prove it from the book). Explain that this kind of question is called a "right there" question because the answer is right there—you can put your finger on it in one place. Ask them to listen as you read and try to make up a "right there" question. Give each student their own copy of the book to follow along as you read.

Comprehension:
Allow students to ask "right there" questions for the rest of the group to answer. When the group answers, ask them to prove it by putting their finger on the answer. Ask students to find a picture of a tree which has lost its leaves and remind them that this is how the tree will look all winter. Explain that today they will draw a winter tree in the winter box. Remind them that they will need to evaluate their work, and review the criteria which will be evaluated. When calling them up for guided reading, have them bring their pictures of winter trees so that you can help them self-evaluate.

Extension or center activity:
Provide students with the poem **Autumn Leaves** written one line per sentence strip. Mix up the lines and have the students sequence them to recreate the poem.

Session 4

Pre-reading:
To the extent possible have students choral read the poem **Autumn Leaves** with you. Give students a copy of the poem to add to their poem collection. Encourage them to illustrate it.

Vocabulary:
Show the vocabulary cards one at a time and ask volunteers to think of a sentence they can say that uses each word.

Reading:
Have students show the winter trees they drew yesterday. Discuss with students how the two trees are alike and different writing their answers on a three-column chart labeled "autumn," "winter" and "both". Provide each student with a copy of the book **Fall Leaves Change Color** and have students echo read the book with you.

Comprehension:
Show students a Venn diagram explaining or reviewing how one is used. Read items from the list asking students to indicate where on the Venn diagram it would be recorded and write it in the appropriate place. (It may be helpful to provide pairs of students with a blank Venn diagram which has been labeled with both words and pictures so that they can indicate the correct location for each fact about the two kinds of trees). Have students reread in unison the words written in each section of the Venn diagram. Ask students what they know about how a tree looks in spring. Ask for a volunteer to show how they might draw it. Send kids back to their tables to draw a spring tree reminding them that they will be asked to self-evaluate. When students are called up for guided reading, or at another convenient time, have them bring their spring tree picture so that you can help them self-evaluate.

Session 5

Pre-reading:
Ask for a volunteer who thinks that s/he can read the whole poem alone. Provide each student with a copy of the poem and have them follow along as the volunteer reads.

Vocabulary:
Ask students what other new words they have learned in their study of plants. Write each word in the box of one of the 5x7 cards. Ask students which words they would like to illustrate for the bulletin board. Explain that they will be doing so when they leave the group today.

Comprehension:
Explain that today the group will be reading the book **Fall Leaves Change Colors** with you and that they will be making up more "right there" questions for a partner to answer and prove. Review what a "right there" question is. Choral read the book as a group. Pair students up and have them take turns asking and answering/proving right there questions. If students are having difficulty with this, practice it longer as a group. Have students think about what a summer tree looks like. Have them illustrate the appropriate box on their worksheet reminding them that they will be expected to self-evaluate. Allow them to do so independently if you think they are ready for this.

Session 6

Pre-reading:
Ask for another volunteer who would like to read the poem **Autumn Leaves** by him/herself; or have students buddy read (use phonics phones if available); or read Revelation 22:1,2 from **Children's International Version.**

Vocabulary:
Using cards which students illustrated in session 5, cover the vocabulary word and see if students can guess what word was being illustrated.

Contraction search:
Tell student that there is only one contraction in this book and that it is pretty easy to find. Tell them on the count of three to start looking for it and to stand, but not say it, when they find it. Add the word "it's" to the contraction chart started earlier (it is the first word of first page!). Have students identify the two words which make up the contraction and record them on the chart paper as well.

Reading:
Teach or review the procedure for buddy reading. Have students buddy read the book using phonics phones if available.

Comprehension:
Have students take turns asking and answering/proving "right there" questions.

Session 7

Pre-reading:
Introduce or reread Revelation 22:1, 2 (written on chart paper) using a volunteer to be the pointer as you read. Ask students what kind of illustrations they would draw for this Bible verse if asked to do so.

Reading Strategy—Breaking up compound words:
Explain that sometimes really big words look scary but the only reason that they are big and scary looking is that two words have been put together to make one word. Give the example of "peanut" and ask students if they see any words in it that they know. Show them how to break the word down into two words. Explain that these kind of words are called compound words. Give several more examples: **pigpen, carport, baseball, classroom.** Have students work with a partner to find the compound words on the following pages and mark them with highlighting tape or sticky notes: pages 4, 7, 22, 26.

Reading:
Explain that today they will be reading the book by themselves for the first time. Ask them what they will do if they come to a word they don't know how to read. Brainstorm a list, recording their ideas. Be sure to include checking to see if the word is a compound word. Teach them to use the teacher as their last resort. Pair students up heterogeneously so that they can help each other if they get "stuck" but explain that they will be trying to read independently as much as possible. Circulate, listening to students read, noting any issues that need to be addressed in upcoming lessons.

Comprehension
Ask students to compare the tree of life in heaven with the trees that we have here. Either as a group or in pairs have students complete a Venn diagram comparing/contrasting the two trees. If working in pairs have students complete a rubric to self-evaluate. Explain to students that in a few days they will be asked to complete a Venn diagram by themselves so they should make sure that they know how to do so.

Session 8

Pre-reading:
Have students echo read Revelation 22:1, 2

Autumn Leaves

Kim Kaiser

Red and orange, yellow, green-
Prettiest colors I've ever seen.
Hanging on the branch so tight-
Will they lose their grip tonight?
Sky is gray, looks like a frown.
Wind blows through, leaves come down.
Summer's gone, now trees will rest.
But first they had to look their best!

Autumn Leaves

Kim Kaiser

Red and orange, yellow, green-
Prettiest colors I've ever seen.
Hanging on the branch so tight,
Will they lose their grip tonight?
Sky is gray, looks like a frown.
Wind blows through, leaves come down.
Summer's gone, now trees will rest.

Name ____________________

spring	summer	autumn	winter

Rubric

spring	summer	autumn	winter
Is the tree in the correct box? 0 1 Are the colors real? 0 1 2 3 Did I do my personal best? 0 1 2 3	Is the tree in the correct box? 0 1 Are the colors real? 0 1 2 3 Did I do my personal best? 0 1 2 3 Is my paper neat, clean and free of wrinkles? 0 1 2	Is the tree in the correct box? 0 1 Are the colors real? 0 1 2 3 Did I do my personal best? 0 1 2 3	Is the tree in the correct box? 0 1 Are the colors real? 0 1 2 3 Did I do my personal best? 0 1 2 3

Cooperative Learning Terms and Explanations

Cooperative group roles—since groups usually consist of four members, four roles are recommended. They may differ from those listed below but these are some that have been used effectively.

- Encourager/leader: This person determines the order in which group members contribute for activities involving turn-taking. This person may be instructed to always take his/her turn last in order to use the servant/leader principle found in scripture (This minimizes the power play). S/he is also responsible for ensuring that group members are affirmed for their efforts.
- Materials handler: This person obtains and passes out materials to his/her group members and is responsible for organizing and returning materials upon completion of tasks
- Recorder: This person records decisions made by the group. This may be done by writing or drawing, but is sometimes done by moving an object to its correct position once this has been determined by the group (as in sorting objects into categories based on common characteristics—they are recording the group's decision by placing the object where the group has decided it should be).
- Reporter: This person gives answers which have been brainstormed by the group and shows and explains to larger groups the completed projects of his/her small group.

It is suggested that role badges be created and worn by the respective students so that, at a glance, the teacher can see who is responsible for each role. ID badges such as those worn in the work place are helpful. Picture symbols help younger students remember the corresponding job descriptions. If a group has less than four members, or if a member is absent, one or more students assume two roles.

To help students choose roles without conflict it is recommended that one student be identified to get the group's badges out and lay them on the table. Then no one is to touch a badge until everyone has agreed that an individual may have the job they have asked for. If there is a conflict in which the parties refuse to compromise, students may roll a die with the person who rolls the highest number having first choice. In this case the die has the final say! Praise groups which complete the role-choosing task quickly and without conflict. If a group has less than four members, the last person to choose a role may have both remaining roles if s/he wishes. To avoid the process of role-choosing, it may be possible to devise a rotating schedule; however, such a schedule becomes complicated when students' skills are diverse. Another disadvantage is that it does not provide the opportunity for students to learn to compromise and to evaluate their own strengths and weaknesses.

Cooperative Learning Structures

These are methods through which students may practice a skill or reveal their knowledge. They allow many more students to be actively involved in discussions and other learning situations than the traditional hand raising methods in which one student is called on. They are content-free, meaning that they can be used across academic areas or for any content within a particular subject area. Various structures accomplish different tasks more effectively than others and, with practice, it becomes easier for the teacher to select the appropriate strategy. For purposes of this unit, most of the descriptions provided are included for quick class-wide review. A few are those which have been mentioned specifically in the lesson plans.

Numbered heads together: This is a structure which is effective for review or any high consensus type questions. Each student in each group is assigned a number from 1 to 4. If there are less than four students in a group, one student takes two numbers. A question is posed to the class. The group members put their heads together to make sure that all members know the answers. On the cue "heads up," students prepare to stand. A number from 1 to 4 is called (it may be generated by a die or randomly chosen by the teacher). All students who are represented by the number which has been called stand quickly. The first to stand gives the answer. Or, if it is a vert high consensus answer, all four may give the answer on the cue "one, two, three." Team scores may be kept, but beware of the negative effects of competition.

Think/pair/share:
Think/pair/share is a simple structure which facilitates the participation of the whole class in answering questions. A question is posed, and students are given a few seconds to think about their answer. They then turn to a partner and each shares their answer with the other. Finally, either members of two groups share their answers between the two groups, or a few members from the class are randomly chosen to share their answers with the whole class. It may encourage active listening if students are required to share an answer given by their partner, rather than their own answer.

Round robin: For this structure a question with multiple answers (for example, what are the four stages of photosynthesis) is asked and students simply take turns stating their ideas within their own group. It may be used for students to get acquainted early in the school year. It also facilitates a brainstorming activity. It is helpful when some or all of the students in a group are too young to write answers.

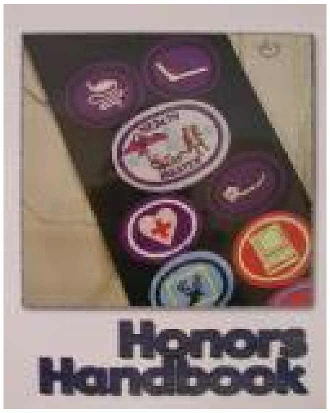
Blackboard share: In this structure, when a group has discussed or brainstormed answers to a question, the recorder writes (or draws, if possible) the group's best answer and the reporter takes it to the board or chart paper and posts it there. This may allow the ideas of one group to prompt further thinking of another group and allows groups to continue thinking while another group is "sharing" its answer.

Gallery tour (referred to simply as "tour" in the plant lesson plans): When groups have completed projects or class assignments, have all students stand and determine a logical flow of traffic. Have students move around the groups so that they can see the work of other groups. This allows for more efficient use of time than having reporters stand and talk about their groups' work one at a time.

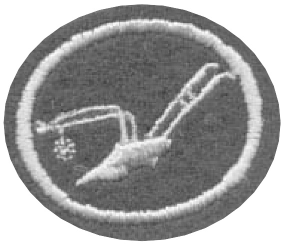
Partner reading: This is done by two students when an assignment needs to be read. It may be helpful when a student's reading skills are below level or to keep students focused. The students may share one book or may sit side by side facing in opposite directions with each student having his/her own reading material. Sitting in opposite directions puts heads closer together, encouraging quieter voices. Students either take turns reading or read together simultaneously.

These ideas are a small sampling of the many possible cooperative structures. These have been taken from the book **Cooperative Learning** by Dr. Spencer Kagan published by Resources for Teachers, Inc. (phone: 1-800-933-2667) or online at www.KaganOnline.com.

Pathfinder/Adventurer Honors



See the resource file for the multitude of honors available to integrate with this unit.



Agriculture

1. List the components of soil. Why is soil important to plants?
2. Explain the difference between clay, sand, and loam soils. List three crops that grow well in each.
3. Test the germination of three varieties of seeds, 100 seeds in each variety. Record germination percentage after three, four, and five days.
4. Explain how plants obtain nutrients and convert them to food. Explain the differences between primary, secondary, and micronutrients.
5. Name and identify ten common weeds of your community and tell how to best eliminate them, using cultural or chemical methods.
6. Identify six common insect pests or diseases. Tell what plants they usually affect and how to eliminate or prevent their occurrence.
7. Locate two sources of agricultural weather information. How is this information helpful to the farmer?
8. Assist in planting, cultivating, and harvesting at least four different crops. Maintain a log of work done and problems encountered from seeding to harvest.
9. Know the purpose of the following:
   - **a.** Plowing
   - **b.** Disking
   - **c.** Cultivating
   - **d.** Irrigation
   - **e.** Harvesting
10. Name and identify ten common birds of your locality, and state their value to the farmer.
11. What is erosion? How can it be prevented?
12. Visit your local cooperative extension service and find out how the organization helps the farmer. Write a one-page report of your visit.

Skill Level 2

Original Honor 1929

Outdoor Industries
General Conference
2001 Edition

Cacti

1. Name the chief characteristics of a cactus.
2. Name three uses of cacti.
3. In what places are cacti the most plentiful? Why?
4. Know and identify from life or pictures 15 species of cacti.
5. Photograph, observe or sketch at least 10 species of cacti and classify them or grow at least 3 different species of cacti.

Skill Level 1

Original Honor 1944

Cacti, Advanced

1. What are succulents?
2. Identify from plants or photos five succulents that are not cacti? How are they different from cacti?
3. Know the definitions of the following terms within a cacti/succulents frame of reference.
   - **a.** Areole
   - **b.** Cephalium
   - **c.** Coalesce
   - **d.** Corymb
   - **e.** Diurnal
   - **f.** Epiphyte
   - **g.** Glochid
   - **h.** Nocturnal
   - **i.** Offshoot
   - **j.** Panicle
   - **k.** Scale
   - **l.** Stolon
   - **m.** Zygomorphic
4. When raising succulents—including cacti—they may be attacked by maladies. What are the most common and how can you prevent or cure the problems?
5. Propagate at least one plant by using one of the following methods: from seed, by cuttings, or grafting.

Skill Level 3

Original Honor, 1999

Nature
General Conference
2001 Edition

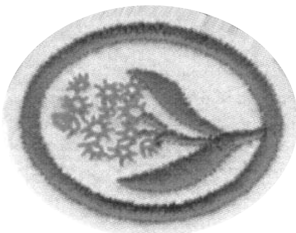
Edible Wild Plants

1. Photograph, collect pictures of or sketch fifteen edible wild plants. Identify each plant in the wild.
2. Identify in the wild five trees and five shrubs which are edible.
3. Identify, prepare, and eat three kinds of wild berries or fruits, three kinds of beverages, three salad plants, three potherbs (greens), and two tubers or roots.
4. Demonstrate the preparation of wild foods in each of the following ways:
   - **a.** Boiling
   - **b.** Frying
   - **c.** Roasting
   - **d.** Baking
   - **e.** Demonstrate how to prepare four parts of the common milkweed or day lily for food.
6. Explain how to identify three "odd-shaped" edible fungi and how to identify the deadly mushroom amanitas.
7. What root plant can be dried and ground into meal?
8. Know at least 8 families embracing the poisonous or doubtful plants.
9. What is the cardinal edibility rule?

Skill Level 2

Original Honor 1970

Nature
General Conference
2001 Edition



Eucalypts

1. How many different species of Eucalypts have been named in Australia?

2. **a**. Where does the name Eucalypt come from?
b. To what family do Eucalypts belong?

3. **a.** In what other parts of the world do Eucalypts grow?
b. In how many are they indigenous to that country?

4. **a.** Which country has the tallest Hardwood?
b. Where is it growing?
c. How tall is it?
d. Which country has the tallest flowering trees?

5. Into what groups are Eucalypts divided and what feature is used for this purpose?

6. How do Eucalypts adapt to
a. Frequent bush fires?
b. Arid regions?

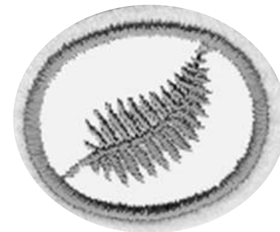
7. **a.** From what species do they extract Eucalyptus oil?
b. Where is it done in Australia?

8. Name ways in which Eucalypts help man, animals, birds, insects.

9. Make a collection of 15 different species of Eucalypts that you can identify and draw or trace or collect the fruit of each showing date and place and name of collector.

South Pacific Division
2001 Edition

Ferns

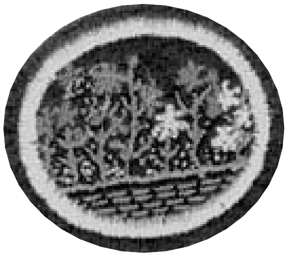


1. How are ferns different from flowering plants or trees?
2. Where is the true stem of a fern? What part grows above the ground? What is the most favorable environment in which ferns grow?
3. How do ferns reproduce? Locate and describe three kinds of sori (from three kinds of ferns).
4. How do spores travel from the parent plant to a new location? How long does it take a spore to develop into a mature plant? Observe from live ferns or pictures how a young fern is different from an adult fern.
5. Know the medicinal uses of three ferns.
6. Draw or photograph ten kinds of ferns and properly identify them.
7. In addition to the common ferns there are fernlike plants known as club mosses and horsetails. Be able to recognize two club mosses and one horsetail. How are they similar to ferns?

Skill Level 2

Original Honor 1944

Nature
General Conference
2001 Edition



Flower Culture

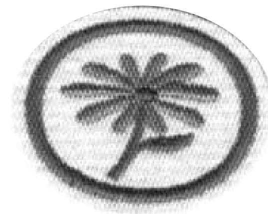
1. Define each of the following:
   a. Perennials
   b. Annuals
   c. Biennials
2. Give general instructions for making a hotbed. What is the difference between a hotbed and a cold frame?
3. What is drainage? Of what importance is it?
4. Name three plant pests and tell how to control them.
5. Give instructions for making a window box and tell its use.
6. Prepare the soil, fertilize, plant, and grow to maturity three different kinds of annuals.
7. Care for two or more perennial flowers growing outdoors for one season by fertilizing, watering, weeding, and treating for pests as needed. Maintain a written record with weekly entries, listing work done.
8. Which three plant nutrients are most important to flowering plants?
9. Identify three flowering plants adapted to each of the following conditions:
   a. Shade
   b. Dry soil
   c. Full sun
   d. Moist soil
10. What is the purpose of a soil test?
11. Make a picture collection of ten annuals, five perennials, and two biennials. Label and know the name of each from memory.

Skill Level 1

Original Honor 1938

Outdoor Industries
General Conference
2001 Edition

Flowers



1. Draw or photograph 35 kinds of flowers and identify them correctly.

2. Draw and properly label or point out the actual parts of a flower:
- **a.** Pistil
- **b.** Stamen
- **c.** Petal
- **d.** Sepal

3. Name six flower families and their distinguishing characteristics. Name at least two flowers in each family.

4. Describe the life history of a particular flower, including the part played by insects or wind in pollination.

5. Name at least two plants that are poisonous to touch and state which, if any, are found in your locality.

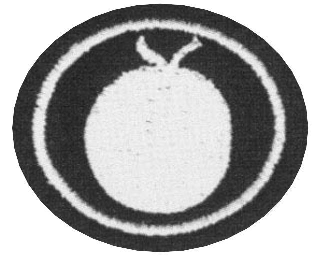
6. Do three of the following:
- **a.** Arrange, draw, or photograph a series of at least six flowers, showing in order the colors of the rainbow-red, orange, yellow, green, blue, and violet.
- **b.** Submit fresh, pressed, or dried flowers having five petals, four petals, three petals, and no petals.
- **c.** Distinguish and name two out of five wild or cultivated flowers by their odor while blindfolded.
- **d.** List flowers that you have observed being visited for food by the following:
  - **(1)** Birds
  - **(2)** Honeybees
  - **(3)** Bumblebees
  - **(4)** Butterflies
  - **(5)** Moths
- **e.** Watch a flower for at least ten minutes in the sunshine and at least ten minutes after dusk, and report on any insect visitors. State the number and kind of visitors and name of flower.

Skill Level 1

Original Honor 1928

Nature
General Conference
2001 Edition

Fruit Growing



1. Why are fruit trees grafted?

2. What does hardiness mean?

3. What site and soil conditions are required to grow three of the following:
- **a.** Apples
- **b.** Peaches
- **c.** Pears
- **d.** Plums
- **e.** Cherries
- **f.** Oranges
- **g.** An equivalent choice grown in your area, not listed above.

4. What is a dwarf fruit tree, and how is it dwarfed?

5. Plant at least two fruit trees and train them by pruning for at least two seasons, or train and prune an existing tree. With supervision fertilize and spray as needed for one growing season. Show an example of harvested fruit to your examiner.

6. Answer the following questions:
- **a.** What is pollination?
- **b.** What is a pollinator?
- **c.** Which trees need a pollinator?

7. How are young trees protected from rodent damage? Protect your young trees from rodents.

8. Compare the qualities of flavor, texture, and appearance of two different varieties of the same fruit.

Skill Level 2

Original Honor 1929

Outdoor Industries
General Conference
2001 Edition

Gardening

1. Prepare soil, fertilize, and plant a vegetable plot of not less than 100 square feet (30.5 square meters). Grow at least six different vegetables, three from seeds and three from seedlings, through harvesting.

2. List ways to control insects and/or disease in your garden. Know when and how to apply insecticides and fungicides.

3. What is mulch? How and why is it used in the garden?

4. What is hardiness? Which vegetables are considered hardy in your area?

5. Do one of the following:
  a. Test germination for 100 of the same kind of seeds.
  b. Make and use a hotbed or cold frame.
  c. Prepare any three varieties of vegetables for market.
  d. Make and use a storage bin or pit for your vegetables.

Skill Level 1

Original Honor 1928

Outdoor Industries
General Conference
2001 Edition

Grasses

1. What characteristics must a plant have to qualify as a grass?
2. What kind of roots do all grasses have?
3. About how many species around the world are there in the grass family called Gramineae or Poaceae?
4. Do the seeds of grasses have two halves as does the bean (a dicotyledon), or does the seed consist of just one part as do the lily, date, and coconut (monocotyle dons)?
5. What unique characteristic in the growth of grass leaves makes it possible for the plant to flourish even though continually mowed or grazed?
6. Name three annual grasses, that is, grasses that sprout from seeds, blossom, bear seeds, and then die the same summer.
7. Name three perennial grasses, that is, grasses whose roots live on from year to year, although the top dies down to the crown each autumn.
8. In each of the following cases name a single grass, or more where indicated, from which the product is made:
   - **a.** Bread (three grasses)
   - **b.** Brooms
   - **c.** Fishing poles
   - **d.** Gluten
   - **e.** Grain alcohol (two grasses)
   - **f.** Hay
   - **g.** Hominy
   - **h.** Molasses
   - **i.** Oatmeal
   - **j.** Starch
   - **k.** Sugar
   - **l.** White flour
9. Do one of the following:
   - **a.** Collect and correctly label ten cultivated grasses.
   - **b.** Write an essay on the various uses of grasses by different people around the world.
10. Press or dry, mount, and correctly label the flower stalks or seed stalks of five pestiferous grasses that are commonly considered to be weeds.
11. In addition to your collection of flower or seed stalks of pestiferous kinds, press, mount, and correctly name the flower stalks or seed stalks of ten additional grasses that grow in your neighborhood. This collection may include some of the plants whose seeds are in your collection of cultivated grasses.

Skill Level 3

Original Honor 1945

Nature
General Conference
2001 Edition

Herbs

1. List 25 culinary herbs and their uses.
2. List 25 medicinal herbs and their uses.
3. Cook one dish using herbs.
4. Make one of the following herbal products:
   - **a.** Cream
   - **b.** herb pillow
   - **c.** jam
   - **d.** soap, paper
5. Make one batch of potpourri.
6. Make one pomander.
7. Name and identify 5 herbs growing wild near you.
8. Name 5 herbs you can use for dying and state the color they give.
9. Name 5 herbs that can be used in insect control.
10. Grow 5 culinary herbs for 3 months.
11. Name 5 herb plants that particularly attract bees.
12. Name 5 herbs mentioned in the Bible and give the Bible references for them.

South Pacific Division
2001 Edition

House Plants

1. Name at least five house plants raised for their foliage.
2. Name three house plants raised for their flowers.
3. Name three house plants adapted to direct sunlight, dry soils, and very moist soils.
4. Most house plants like a 65-to 75-degree (18 C - 22 C) temperature. Name one that requires a cool room (45 to 55 degrees F.) (7 C - 13 C).
5. Prepare a special potting mix soil including at least 3 different ingredients. Select two house plants from requirement two and grow them in this soil for three weeks.
6. How much light does an African violet need? Where in the house is the best place to grow them? Grow two or more African violets.
7. All gesneriads need approximately the same growing conditions. Where do they come from originally? What kind of temperature, light, and humidity do they need?
8. Name two house plants that can be propagated from leaves, stem sections or divisions. Select one plant from requirement two above, experiment with each of these mothods of propagation and keep them growing for three months.
9. What is a Bonsai?
10. What is humidity? How is it important to house plants?
11. Below is a lists of plants to chose from for requirement five and eight above:
    - **a.** Narcissus
    - **b.** Aspidistra
    - **c.** Philodendron
    - **d.** Aluminum plant
    - **e.** Daffodil
    - **f.** Sanseveria
    - **g.** Boston fern
    - **h.** Piggy-back plant
    - **i.** Bird's nest fern
    - **j.** Caladium
    - **k.** Gloxinia
    - **l.** Spider plant
    - **m.** Geranium
    - **n.** Maidenhair fern
    - **o.** Begonia
    - **p.** Ficus
    - **q.** Tulip
    - **r.** Iris
    - **s.** Crocus
    - **t.** Coleus
    - **u.** Hyacinth

Skill Level 2

Original Honor 1976

Nature
General Conference
2001 Edition

Lichens, Liverworts, and Mosses

1. Know the life cycle of a moss, lichen, or liverwort.
2. What are lichens?
3. Name at least two ways lichens have been of value to man.
4. How are liverworts different than all other green plants? Name one used in aquariums. What is its function?
5. Describe at least three significant ways moss has played in the economy of man.
6. Make a moss garden (small terrarium) or "eternal garden" using at least three different kinds of mosses and lichens.
7. Find and identify five lichens, one liverwort, and six mosses.
8. Observe the spore caps of several different kinds of moss under a magnifier to see the differences in "hair caps" and "teeth" that separate many species.

Skill Level 3

Original Honor 1961

Nature
General Conference
2001 Edition

Orchids

1. Define the characteristics of an orchid.
2. What are the two main groupings of orchids? Name and show examples of each from a live plant or picture.
3. What are the differences between epiphytic, parasitic, and saprophytic orchids?
4. Discuss the distribution of orchids, making particular reference to the occurrence of these in your area.
5. Name the main cultivated genera of orchids. Identify three from plants or picture. What is cultivar?
6. Discuss the main essentials to observe in the cultivation of orchids. Grow at least one orchid for at least six months.
7. What are the main uses of orchids? What orchid is used commercially?
8. Know the laws in your area (if any) that protect wild orchids.

Skill Level 1

Original Honor 1964

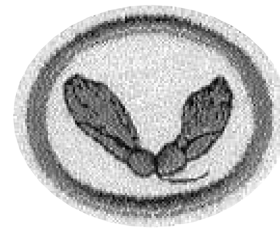
Nature
General Conference
2001 Edition

Palm Trees

1. Give the general characteristics of the palm tree referring to the following parts:
   - **a.** Stem or trunk
   - **b.** Roots
   - **c.** Leaves
   - **d.** Inflorescence or flowers
   - **e.** Fruits
2. **a.** What happens when the crown of a palm is cut out?
   b. What happens when the trunk of a palm is damaged?
3. In the Pacific islands there are several species of palm trees which are helpful to man. Name two of these and list as many ways as you can how each helps man.
4. Identify by sight six different types of palms which grow in your area. Do this in any language.
5. Draw and name the six palm trees you have identified showing clearly the leaf formation, flowers and seed shape as well as the fruit.
6. Parts of palms are used for food or to help with the preparation of food. From your culture tell how a palm tree or part of it is used as food or in food preparation e.g. sago palm, coconut palm. Tell how to prepare it.

South Pacific Division/Island Ed.
2001 Edition

Seeds



1. What is the main purpose of a seed?

2. What foods were first given to man in the Garden of Eden?

3. Identify from a seed or drawing and know the purpose of each of these parts of a seed: seed coat, cotyledon, embryo.

4. List from memory four different methods by which seeds are scattered. Name three kinds of plants whos seeds are scattered by each method.

5. List from memory ten kinds of seeds that we use for food.

6. List from memory five kinds of seeds that are used as sources of oil.

7. List from memory five kinds of seeds that are used for spices.

8. What conditions are necessary for a seed to sprout?

9. Make a collection of 30 different kinds of seeds, of which only ten may be collected from commercial seed packages, the other 20 you are to collect yourself. Label each kind as follows: seed name, date collected, location collected, and collector's name.

Skill Level 1

Original Honor 1961

Seeds, Advanced

1. Have the Seeds Honor

2. Identify from drawings and know the purpose of each of the following parts of a seed: endosperm, radicle, plumule, micropyle.

3. Know several differences between a monocotyledon seed and a dicotyledon seed, and give three examples of each.

4. Explain the purpose and use of a "rag doll" seed tester. Use it to test the germination of 100 seeds of a wild plant and 100 seeds of a domestic plant. Report the results of each test.

5. How does a seed differ from a spore?

6. Write or tell orally two spiritual lessons we may learn from seeds. You will find help in Christ's Object Lessons by Ellen G. White, pages 33 to 89.

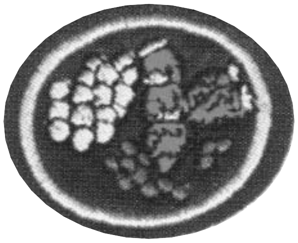
7. Make a collection of 60 different kinds of seeds, of which only 15 may be collected from commercial seed packages, the other 45 you are to collect yourself. Label each kind as follows: seed name, date collected, location collected, and collector's name.

8. Have in your collection four kinds of seeds from each of two families of plants, showing the similarity between the seeds of plants in any one family.

Nature
General Conference
2001 Edition

Skill Level 2

Original Honor 1961



Small Fruit Growing

1. What are the soil requirements for growing bramble berries, strawberries, grapes, and blueberries?
2. Write a one-page report telling how to grow one of the above fruits. Include the following:
    - **a.** Variety selection
    - **b.** Soil preparation
    - **c.** Planting techniques
    - **d.** Fertilizing
    - **e.** Pruning (where applicable)
    - **f.** Watering
    - **g.** Pest control
    - **h.** Harvesting
3. Name three varieties of each fruit that will grow well in your area.
4. Prune two blueberry bushes, two grape vines, or a ten-foot row of bramble berries at the proper time in the family garden or for a friend or neighbor.
5. What is a perishable crop?
6. How long can strawberries, bramble berries, blueberries, and grapes be stored?
7. Describe a serious insect or disease pest for each fruit. Include when the problem occurs, damage caused, and chemical or cultural treatments. Use as many pictures or drawings as possible.
8. Take a soil test from a garden and determine which fruits will grow there. Ask for fertilizer recommendations for one of the crops and determine the cost of fertilizer needed for six 100-foot (30.5 meters) rows.

Skill Level 2

Original Honor 1986

Outdoor Industries
General Conference
2001 Edition

Trees

1. Describe the ways in which trees and shrubs differ.

2. Collect and identify typical leaves from 15 different species of trees. Spread neatly, press dry, mount, and label in a suitable notebook or on uniform-size sheets of paper.

3. Name two examples each of trees that have been named for:
- **a.** What they are used for
- **b.** The surroundings or environment in which they grow
- **c.** Some distinctive feature
- **d.** The geographic region in which they live
- **e.** Persons who first found and described them

4. Give the common name and tell the difference between the two great classes of trees.

5. Describe the importance of forest conservation in your area.

6. Name several examples of the kinds of wood used in each of the following:
- **a.** Flooring for houses
- **b.** Common plywood
- **c.** Furniture
- **d.** Ax handles
- **e.** Fence posts
- **f.** Railroad ties
- **g.** Support beams for construction work
- **h.** Bows and arrows
- **i.** Ideal for use as kindling
- **j.** Burns slowly and leaves a bed of hot coals

7. Name two examples each of trees which:
- **a.** Grow best in wet lands
- **b.** Grow best at high levels in mountains

Skill Level 1

Original Honor 1928

Nature
General Conference
2001 Edition

Additional Pathfinder honors and Adventurer honors may be found at the following web-site:

http://www.pathfindersonline.org/html/honors/honors_ay_manual.htm

Project Ideas

Portable Garden:

Line a child's wagon with plastic and place small stones on the bottom for drainage. Add soil and plant a flower or vegetable garden. When weather permits, roll the garden outside for sun. When it is too cold, roll it inside and continue to watch it grow. Keep it where it can get lots of light. Be careful not to over water!

Leaf Collection

Chocolate Leaves

Collect clean, bug-free leaves. Rinse them in cold water and pat dry. Spray the bottom with Pam and place on cookie sheet. Microwave or melt chocolate chips. Using a new paintbrush, brush the chocolate onto the bottom of the leaf. If possible, place cookie sheet into refrigerator.

When the chocolate has re-hardened, carefully and quickly peel off the leaf. You should see a chocolate leaf, ready to eat!

Games

Have students make a game that practices what they have been learning. It could be a memory game that matches words with pictures/definitions, or a sequencing game containing steps in the fertilization or pollination processes.

Students could create a board game or "Wheel of Fortune" game. They could draw and color pictures and cut them out for other students to sequence.

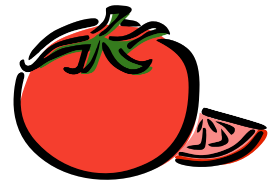
Song

Have students write a song to help them remember a concept or some vocabulary words. Sing it to the tune of a familiar song, such as Yankee Doodle. Or write a song to help a younger student learn something he/she needs to know about plants. Or write words to a spiritual song thanking God for His amazing creativity and genius in designing the plant world.

Flower and Salad Beds

If you have little time and space, use the edges of flowerbeds to plant radishes, spinach, and lettuce. In less than a month you can harvest these plants. Add other greens and toss for a salad.

The Terrific Tomato



Taken from *Natural Learning,* May 1998, Volume 1, Number 5, pg. 12 & 13

Do you know these facts about the tomato?

- ✓ The tomato is a fruit.
- ✓ The wild species of the tomato originated in South America.
- ✓ Inhabitants of Mexico developed cultivated forms of the tomato before 1492.
- ✓ Explorers took tomatoes from Mexico to Europe, where in 1554 the fruit was called the "pomi d'oro, or apple of gold. (What does this tell you about the color of the fruit at that time?)
- ✓ Thomas Jefferson was probably the first person to cultivate tomatoes in the United States.
- ✓ Late into the 1800's the US Supreme Court declared the tomato a vegetable.
- ✓ Catsup and salsa are counted as vegetables on some school menus.
- ✓ The tomato is grown commercially in ever state in the US except Alaska.

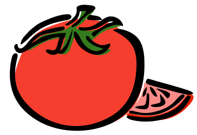
In the past several hundred years, the tomato certainly has become a common food. We eat it sliced—alone, on sandwiches, and in salads. We enjoy it in soups and sauces. And it is a primary ingredient in catsup (also spelled ketchup). Modern tomatoes come in reds, yellows, and pinks. They may be small or large, round or oval. And they are available year round. It would seem unusual for us to walk into a grocery store and not find several varieties of tomatoes to choose from.

But maybe tomatoes should be sold in pharmacies, too!

The tomato has an abundance of vitamin C and beta-carotene, a cancer-fighting chemical. And scientists have recently discovered lycopene, a chemical found in red-colored fruits, also helps to prevent certain kinds of cancer. The amount of lycopene in tomatoes is especially high. Therefore, eating at least one serving of tomatoes a day is a very healthful habit to get into.

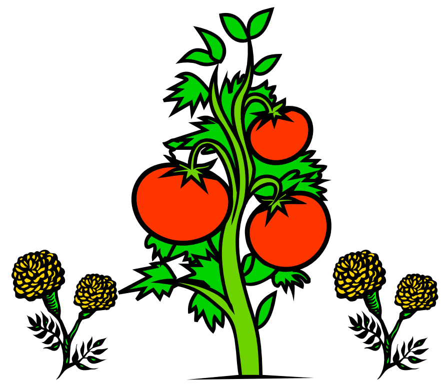
Should we eat just tomatoes? Absolutely not! Goodies like broccoli, and cauliflower, carrots and squashes, oranges and grapefruits, mangoes and papayas, and all kinds of berries—also give us an anti-cancer treatment. Add soybeans, nuts, and grains, and we have a natural medicine-chest full of cancer-fighting compounds.

The Terrific Tomato—A Potful of Health



Taken from *Natural Learning,* May 1998, Volume 1, Number 5, pg. 12 & 13

You don't need a garden plot to grow terrific tomatoes. Some varieties are ideal for pots and tubs. Ask at a garden center for container friendly tomatoes. Patio, Small Fry, Container Choice, and LaRoma are some varieties to look for.



WHAT YOU NEED…

- container
- potting soil
- tomato plant suitable for the container
- marigold seeds
- paper and pen

WHAT TO DO

- Transplant the tomato plant into the container.
- Plant a circle of marigold seeds in a ring along the outer edges of the soil in the pot. These easy-to-grow but bitter flowers form a natural defense against hungry insects.
- See that the plant gets plenty of sunlight, water, and warmth.
- Keep a daily record of plant growth, either in a journal or on a chart.
- Wait about two months.
- Enjoy the fruits of your labor!

NEWS FLASH !!

Don't put your tomato plants outside too early. Scientists at the US Department of Agriculture have determined that when the temperature falls below 50 degrees F., biochemical processes crucial to the plants' development shut down. When those processes rev up again in response to the next day's warm temperature, they interfere with the processes that are supposed to go on during the day. The confused plant cannot carry out photosynthesis properly and will likely produce fewer tomatoes.

FLOWERS I KNOW

- ☐ Alsike clover
- ☐ Birdsfoot violet
- ☐ Bloodroot
- ☐ Blue-eyed grass
- ☐ Bluets
- ☐ Bullhead lily
- ☐ Bunchberry
- ☐ Cheeses
- ☐ Columbine
- ☐ Curled dock
- ☐ Dame's rocket
- ☐ Day-lily
- ☐ English plantain
- ☐ Field chickweed
- ☐ Forget-me-not
- ☐ Fringed polygals
- ☐ Glasswort
- ☐ Grape hyacinth
- ☐ Greek valerian
- ☐ Indian pipe
- ☐ Kidney-leaf buttercup
- ☐ Birdfoot trefoil
- ☐ Black swallowwort
- ☐ Blue dogbane
- ☐ Blue flag
- ☐ Bramble
- ☐ Bugle
- ☐ Cancer root
- ☐ Cinquefoil
- ☐ Comfrey
- ☐ Cypress spurge
- ☐ Dandelion
- ☐ Dead nettle
- ☐ False Solomon's seal
- ☐ Field pansy
- ☐ Four-o'clock
- ☐ Gill-over-the-ground
- ☐ Goldthread
- ☐ Great Solomon's seal
- ☐ Hop clover
- ☐ Jack-in-the-pulpit
- ☐ Large-flowered trillium
- ☐ Lesser celandine
- ☐ Lobelia
- ☐ Marsh-marigold
- ☐ Mertensia
- ☐ Nightshade
- ☐ Ox-eye daisy
- ☐ Periwinkle
- ☐ Pineapple weed
- ☐ Pussytoes
- ☐ Red clover
- ☐ Robin's plantain
- ☐ Sheep sorrel
- ☐ Spiderwort
- ☐ Star-of-Bethlehem
- ☐ Stinging nettle
- ☐ Vetch
- ☐ Virginia dayflower
- ☐ Wild geranium
- ☐ Wild oats

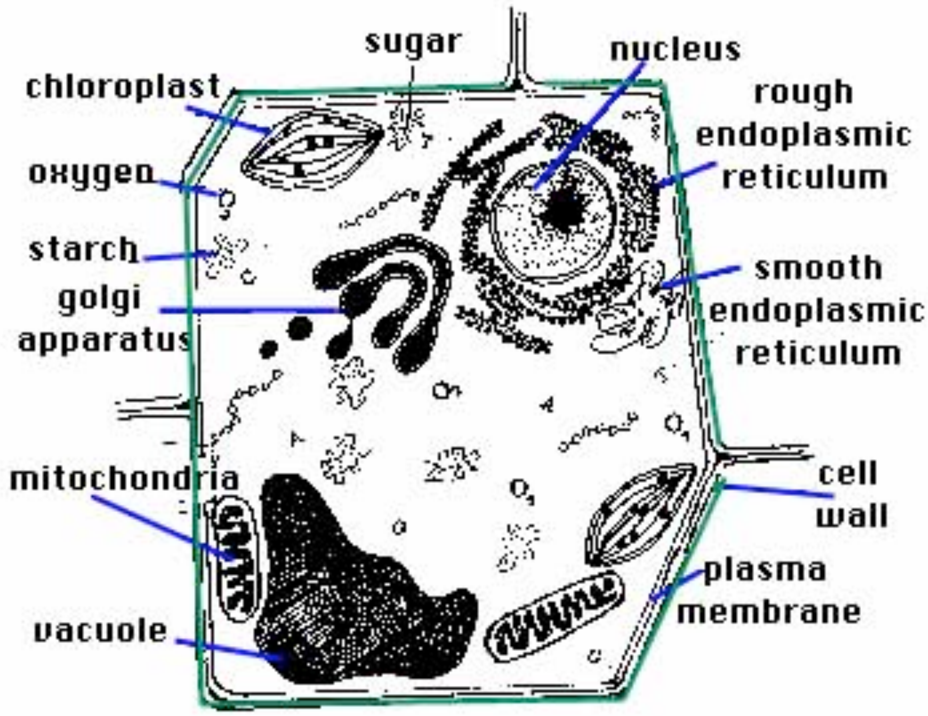
- ☐ Winter cress
- ☐ Wood betony
- ☐ Yarrow
- ☐ Less stitchwort
- ☐ Lupine
- ☐ Mayapple
- ☐ Moccasin flower
- ☐ Nodding trillium
- ☐ Orange hawkweed
- ☐ Pinks
- ☐ Rabbit's foot clover
- ☐ Red trillium
- ☐ Sarsaparilla
- ☐ Shepherd's purse
- ☐ Speedwell
- ☐ Starflower
- ☐ Trailing arbutus
- ☐ Trout lily
- ☐ Violet
- ☐ Wild carrot
- ☐ Wild lily-of-the-valley
- ☐ Wild strawberry
- ☐ Wood anemone
- ☐ Wood sorrel
- ☐ Yellow-eyed grass

Name: ___________________________ Date: ________________________

Draw a plant cell. Label it. Use the words below to help you.

Nucleus	Nucleolus	Nuclear membrane
Mitochondrion	Ribosome	Endoplasmic reticulum
Golgi apparatus	Centriole	Cell Membrane
Cell Membrane	Nuclear pore	Vacuole
Chloroplast		

CROSS-SECTION OF A PLANT CELL

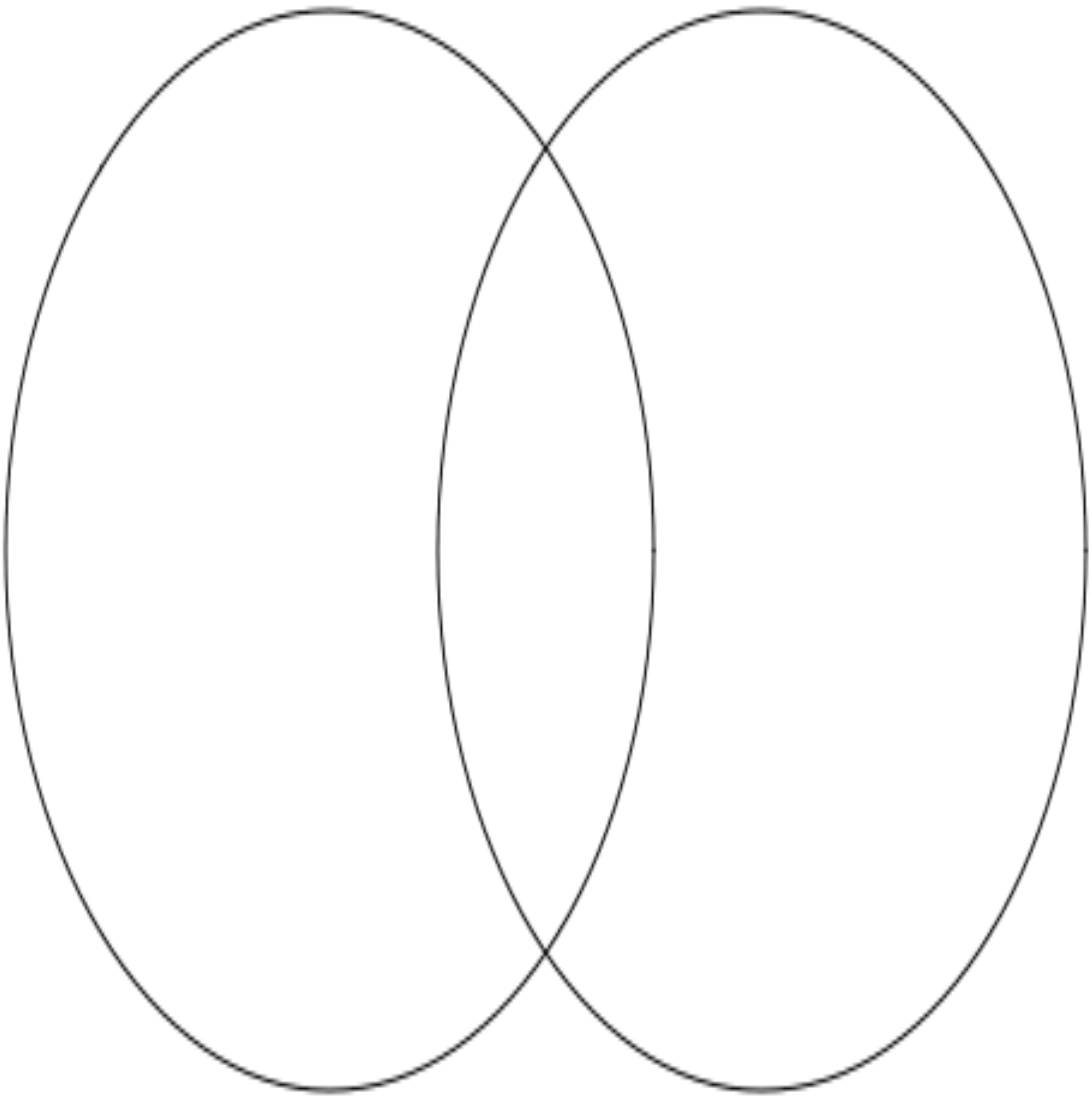


Can you find the same parts on this diagram?

Plant and Animal Cells Venn Diagram

Word Bank

Cell membrane Cell wall Chloroplast	Cytoplasm ER Mitochondria	Nucleus Ribosome Vacuole



How To Plant A Tree

Trees die every day from disease, natural disasters, drought, and by man cutting them down. It is important that we replace the trees that are lost each year.

Research "Arbor Day". Then, with your class, choose a tree that will grow well in your area and plant the tree.

Here's how!

Dig a hole big enough for the roots to spread out. The bigger the better! Pile the topsoil on one side and the subsoil on the other. If you want to stake the tree, put the stake in now to one side.

Put the tree in the hole. Carefully spread the roots. Add some water. Cover the roots with the topsoil. Then put the subsoil on top of the hole.

Water again. Add a layer of mulch. Tie the tree to the stake.

During the first year water the tree frequently to help the roots to take hold. You may need to wrap the trunk with burlap to protect it from too much sun and insects.

Name: ______________________________

My Plant is: __________________________

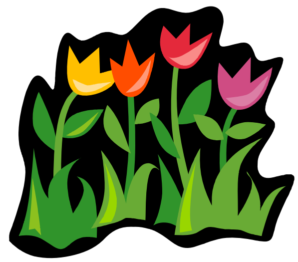
PLANT GROWTH CHART

DATE	HEIGHT	OBSERVATIONS

Name: ______________________

Experiment: __________________________

Date:	plant	plant	plant	plant	plant



Plant a School Garden

There are many resources available on the Web for those who would like to start school gardens.

Search for “school gardens” or “kids’ gardening” to find a wealth of ideas. There are even grants available!

A Garden At Your School

Quoted from an email to Larry Blackmer from Carrie Beets
lovetoohike@msn.com

The gardening component which the Spirit of Prophecy instructs us to have in our schools is about presenting the plan of salvation to the students through nature's classroom, with hands-on garden time, to experience the spiritual lessons, to discover God through his beautiful creations, and to develop the student's spiritual character. It is also about providing them with practical knowledge and skills for the time when those faithful to God will find it extremely difficult to buy or sell. That last day event may occur in the lifetimes of our current students. A stumbling block to implementing a gardening component in our SDA schools is the day to day how-to as how to get started.

In researching the feasibility of adding a gardening component to our schools, I have discovered that there are public schools across the US and Canada that have incorporated a gardening component into their elementary, middle school, and high school educational systems. They not only use the gardening component for science class, but have figured out how to incorporate other academics (math, history, economics, poetry, nutrition, etc.) I found one public school that flat out say that in addition to academics they are using the garden component for character development. Imagine that! Adventist schools are supposed to be the head, not the tail!

It is not necessary to have a huge garden. You will see on some sites that some schools have very modest sized school gardens, simply allotting one garden bed per grade.

There are a number of schools that have information about their programs on the Web. Some have theme gardens: some grow flowers from seed and sell the potted plants for Mother's Day. Money earned from the sale of potted plants helps fund the garden program. Some grow salad items for the school cafeteria. Some grow food and donate it to community organizations that feed the poor. Some have a junior master gardener club.

There are tried and proven written techniques and teachers' guides available. There are even grants and other sources of funding available. There are both government and private grants. In addition to being able to compete for these funds, hopefully these sites will give you ideas for approaching local businesses, local philanthropic organizations, and local gardening groups as well as Adventist organizations for funds/in-kind donations/contributions/labor to help with establishing and upgrading the school gardening component.

The only piece that SDA teachers/schools would have to come up with themselves is the spiritual component, the application of spiritual lessons.

Envisioning forging ahead into unknown territory can be daunting. But knowing that schools throughout the country are actually doing gardening components in their educational systems and that there are organized, printed resource materials out there brings gardening component projects into more reasonable focus. Add to that, prayer and guidance from the Lord and you have a winning formula.

Some starter sites:

- www.ccsherrard.us/tg/intro.html
- http://www.cedar-falls.k12.la.us/Buildings/Hansen/staff/JVenega/hansengardens.htmlwww.rootsnshoots.inor/history.asp
- www.sonic.net/-roniz/hhp/index.html
- www.cityfarmer.org/Lordrob19.html#Lord%20Roberts
- www.store.yahoo.com/nationalgardening/index.html

These sites list grants that are available to help fund school garden programs. Grants include both government grants and private grants such as the Dutch bulb grant and the Home Depot grants. There is a Healthy Sprouts award given out by the National Gardening Association and the Organic School Garden Awards given out by the Rodale Institute.

- www.kidsgardening.come/2005.kids.garden.news/june/pg4.html
- www.kidsregen.org/gardens/index.shtml
- www.kidsgardening.com/resources/resource.asp

The National Gardening Association has developed a "Garden In Every School" Registry that currently lists 787 non-SDA schools in the United States that have gardening programs in their schools. It lists the schools by state.